MAR 25 1932

VOLUME 15 NUMBER 3

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MARCH, 1932

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO, ILLINOIS. ANNUAL SUBSCRIPTION, $6.00

Entered as Second-Class Matter, January 14, 1925, at the Postoffice at Chicago, Illinois, Under the Act of March 3, 1879. Acceptance for mailing at special rate provided for in Section 1103, Act of October 3, 1917, authorized January 22, 1925.

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BILATERAL ABDUCTOR PARALYSIS

OPERATIVE TREATMENT BY SUBMUCOUS RESECTION OF THE VOCAL CORDS *

W. B. HOOVER, M.D.

BOSTON

The material for this paper is based on a review of the literature and a study of eighteen cases that have been seen in the Lahey Clinic. Six of the eighteen cases were temporary; three of the six were caused by operative procedures in the clinic, and in the remaining fifteen the patients had developed the paralysis elsewhere before admission to the clinic.

FUNCTION OF THE CRICO-ARYTENOIDEUS POSTICUS MUSCLES

In bilateral abductor paralysis there is a loss of function of each crico-arytenoideus posticus muscle, which in normal function abducts the vocal cords, opening the glottis, and permits the free passage of air from the upper to the lower respiratory passages.

Cause of Loss of the Abductor Function.—To paralyze the crico-arytenoideus posticus muscles on both sides there must be one or more lesions either in the brain near the nuclei of the vagus or along the course of the vagus or recurrent laryngeal nerves. It is rare, however, for two lesions to occur in the same patient, which results in paralysis of each posticus muscle. Loss of function of the posticus muscles has occurred with peripheral neuritis due to diphtheria, typhoid fever and other acute infectious diseases and to lead poisoning. It can also occur by direct infiltration of the muscle or other laryngeal structures from a new growth or by the inflammatory products of syphilis and tuberculosis. Furthermore, it can be produced by inflammation and ankylosis of the crico-arytenoid articulation. This last condition I have never been able to diagnose, even of one side.

The most common cause of bilateral abductor paralysis, in our experience at the Lahey Clinic, has been direct trauma or operative injury by surgical procedures in the regions through which these nerves pass, or direct pressure by, or involvement in, a pathologic condition in these regions. In seventeen of the eighteen cases seen in the

* Submitted for publication, Sept. 7, 1931.

* Read by invitation before the American Laryngological Association, Atlantic City, N. J., June 17, 1931.

clinic the cause of bilateral paralysis was related to thyroid conditions. Fourteen followed thyroid operations; one, a malignant condition of the thyroid; one, syphilis of the thyroid, and one, a thyroid condition and a tumor of the neck; one followed a fracture of the larynx, high tracheotomy and perichondritis. Laryngeal paralysis due to benign enlargement of the thyroid has been very rare in our experience.

THE CLINICAL HISTORY IN CASES OF ABDUCTOR PARALYSIS

History.—The history of postoperative thyroid bilateral abductor paralysis reveals that directly following a thyroid operation the patient finds that he is hoarse and perhaps cannot speak above a whisper. With this there may be some stridor. Stridor may necessitate a tracheotomy shortly after the onset. In five of the cases that are reported, the patients underwent tracheotomies for this reason while they were still in the hospital for a thyroid operation. Usually there is a fair airway, and breathing is not difficult. Later the voice improves and the stridor becomes more marked, interfering with the air supply to such an extent that the patient's activities are limited. In case 13 of my series, stridor began and the voice returned two years after the thyroid operation, this being an exceptionally long interval. As the stridor develops, a crowing also appears, especially when the patient sleeps. Not only is there difficulty in breathing, but difficulty in swallowing frequently occurs, with "choking spells" (so-called by the patient) due to the aspiration of saliva or food into the larynx. With a mild infection of the upper respiratory tract, the patients become complete invalids with great fear of suffocation. At such times an emergency tracheotomy may be necessary.

Examination.—The patients seen at the clinic who have not had some measure for relief are usually invalids confined to their homes, unable to do their work and having difficulty in breathing on the least overexertion, showing all the signs of inspiratory obstruction, while expiration is not difficult. In talking the patients are able to say only a few words without stopping to take an inspiration, accompanied by stridor. During sleep, a roaring or snoring noise is made which may be so loud as to be heard at a considerable distance. The noise may become such an annoyance in a hospital or a hotel that people, unless accustomed to it, are greatly disturbed. In fact, several of these patients were thought to be dying by laymen because of this "terrible" noise.

Examination of the larynx shows the arytenoids and vocal cords in the median position with only a narrow chink between them. On expiration, the cords open in the middle portion and are lifted upward slightly by the current of air. On inspiration, the cords are drawn downward and together, decreasing the already narrow glottis. Occa-

sionally the cords may assume the cadaveric position (such patients have no difficulty in breathing, but may seek aid for aphonia). Such cases have not been seen in the clinic. In cases of unilateral paralysis, the paralyzed cord more frequently lies in the median position than in the cadaveric position, which is contrary to the impression most often received from textbooks and teachers of laryngology.

Ideal Treatment.—The ideal treatment in bilateral abductor paralysis, that of restoring function to the paralyzed muscles, has been attempted but as yet has not been fully accomplished. Attention, therefore, has been directed to the relief of the most distressing obstruction, and, of course, when this is successfully treated, an injury to the normal speaking voice results. However, when one has seen the pitiable plight of a patient who is unable to be about among friends because of the difficulty in carrying on a conversation, whose rest is disturbed by want of air, whose sleep is objectionable to others on account of the noise, who is worn by the respiratory effort or who is obese because he is unable to exercise and is really an invalid gasping for breath on the least exertion with fear of death by suffocation during mild respiratory infections, one cannot hestitate to give such a person a free airway regardless of the voice. It is the purpose of this paper to present a method of extending relief to these patients.

When the obstruction is relieved, the voice is not lost entirely, but is impaired. The patient, as a rule, is able to talk more, and when he returns to work he considers himself a useful person and is much happier. He is truly grateful for the marked improvement gained. Too often these patients have been told that nothing can be done for them, and some have even been told never to let any one attempt to do anything. This has been considered good advice in view of past operative results, but does not hold since laryngofissure has been developed into a relatively safe operation in which submucous resection of the vocal cords or the operation of Rethi may be performed. The least that can be done, in my opinion, is a tracheotomy. Any one with stridor sufficient to limit the activities should have a tracheotomy, and it is almost criminal not to do this or to remove the tracheotomy tube before a free airway has been established, as occurred in two cases of this series. A few patients may be happy with this simple procedure and are content without further treatment. However, patients become tired of a tracheal tube, and some are willing to undergo other operative procedures.

Indication for Operation.—The operation for permanent relief of the stenosis should be done when it is decided that recovery is no longer probable, and when nerve anastomosis cannot give a satisfactory result, if technically possible; for example, when the arytenoids have become ankylosed or the paralysis is of such duration that atrophy of the

muscle has occurred, one is justified in proceeding with surgical intervention. Most spontaneous recoveries will take place within a year. Jackson expressed the belief that from one and a half to two years should elapse to allow recovery in children. In case 4 of my series, recovery of one vocal cord occurred twenty months after thyroid operation.

OPERATIVE METHODS

In the past various operative procedures have been tried, most of which have been failures. Plastic operations that widen the anterior portion of the larynx have generally been failures. Lateral transplantations of the anterior portions of the cord have not met with success.

Figure 1

Figure 2

Fig. 1.—Larynx opened in the midline. The opening is as in an operation for submucous resection of the cord.

Fig. 2.—Mucous membrane elevated over the true cord. The larynx is widely open to give better view.

Jackson stated that endoscopic evisceration is quite effectual, and with ventriculocordectomy he reported seven satisfactory cases out of eighteen. He attributed failure in the other eleven cases to cicatricial stenosis complicating the abductor paralysis. Laryngostomy, while successful, requires long disability and care—months, or even years. The reestablishment of function by nerve anastomosis has been disappointing, yet is deserving of further trial. Rethi has described a method of displacing the vocal cords and arytenoids to the extreme respiratory position and holding them in this position by ankylosis of the cricoid arytenoid articulation. The adductor muscles are divided; the ary-

tenoids are held by a tampon until ankylosis has occurred. Submucous resection of the cord has been done by Killian, Dahmann, Weingartemn and Albrecht with very promising results.

Methods Tried in the Lahey Clinic.—Section of the recurrent and superior laryngeal nerves, nerve anastomosis, plastic operations on the larynx to widen the anterior portion and lateral transplantation of the cords have been tried in the clinic, and all have been failures. Submucous resection of the cords and soft tissues of the larynx has been satisfactory in the four cases in which it has been done.

Principle of Operation.—The object of submucous resection of the vocal cords is to widen the lumen of the larynx by the removal of soft

Figure 3

Figure 4

Fig. 3.—Same as figure 2, with the soft tissue between the mucous membrane and the thyroid cartilage removed; the vocal process of the arytenoid has also been removed.

Fig. 4.—Opening as in figure 1, with the mucous membrane placed against the cartilage after removal of the vocal process and the soft tissue, as in figure 3.

tissue between the mucous membrane and the cartilage of the lateral wall, which permits the mucous membrane to be placed on the lateral wall and thus to increase the lumen and prevent the formation of granulations that are so prone to develop where denuded surfaces exist in the larynx, and without scarring there is not the usual secondary contracture.

In carrying out this procedure, a tracheotomy is done before operation if a tube is not already in place. I would like to emphasize here the

fact that all tracheotomies should be done below the cartilages that enter into the formation of the larynx and preferably below the second ring of the trachea, and further to call attention to the fact that an amazing number of laryngotomies are performed (but called tracheotomies by the operators) that lead to permanent dependence on a tube or require long care to relieve the cicatricial stenosis that is caused by tubes in contact with the laryngeal cartilages. Before anesthesia, either local or general, is given to do the tracheotomy, it is best to establish a free airway by the passage of an intertracheal tube with a laryngoscope. An English catheter will serve this purpose and is well borne

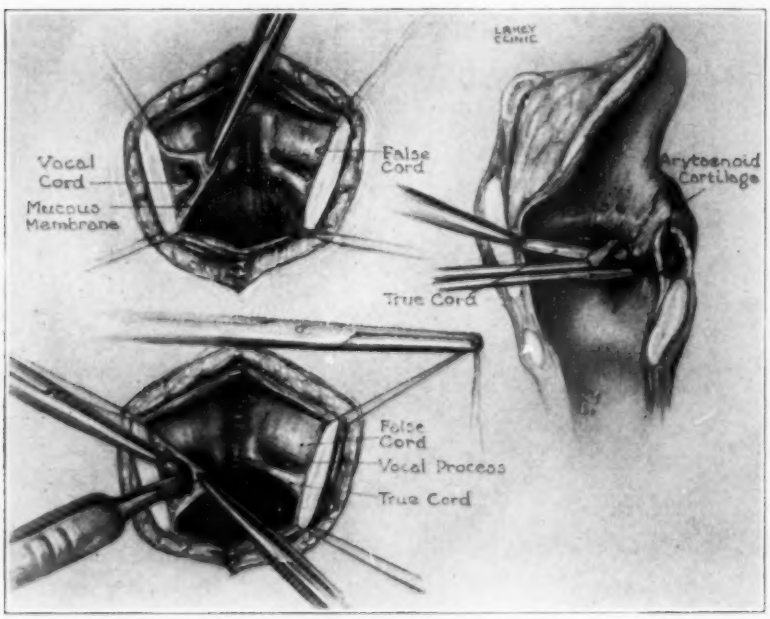

Fig. 5.—Operation for removing the vocal cord.

if a few drops of 10 per cent procaine hydrochloride are dropped into the catheter and coughed out through the larynx.

The Operation.—The operation then proceeds as follows: The patient is placed on his back, a pad under the shoulders and the head extended on the table. A midline incision is made and carried through the cricothyroid membrane. If procaine hydrochloride has not already been introduced into the larynx, it is done at this time with a small syringe and needle. Bleeding is controlled. One blade of a heavy scissors is introduced through the cricothyroid membrane and carried upward between the cords. The thyroid cartilage and mucous membrane of the larynx are opened in the midline. A long gauze wick is packed

above the tracheotomy tube in the upper part of the trachea to prevent the aspiration of blood or secretions. If local anesthesia is used, a procaine hydrochloride pack can be placed in the larynx. Silkworm gut sutures are placed in the upper and lower portions of the thyroid cartilage to serve as retractors and are held by forceps. With sharp dissection the mucous membrane is separated from the region below the true cord, over the cord and upward lateral to the ventricle of the larynx and posteriorly behind the vocal process of the arytenoid. The soft tissue is then separated from the thyroid cartilage. With a curved scissors, curved at a right angle, or with a punch, the soft tissue and the vocal process of the arytenoid are removed. Any troublesome bleeders are caught with a hemostat and touched with diathermy. Usually only one active bleeder is encountered. After the bleeding has been fully controlled, the membrane is sutured along the anterior

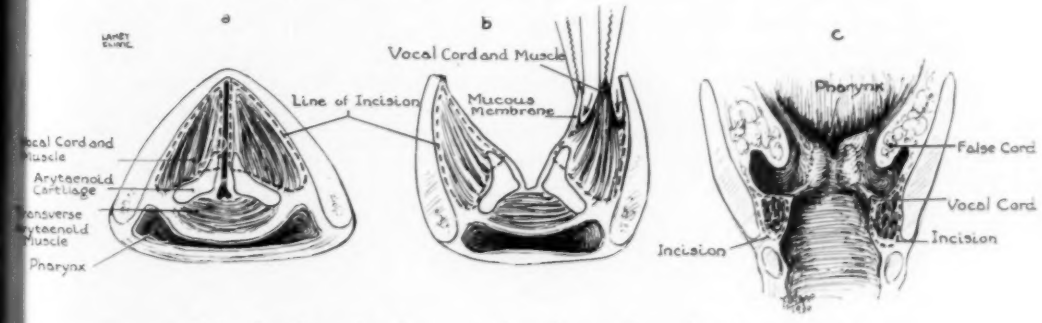

Fig. 6.—Operation for removing the vocal cord and muscle.

incision. The wick in the trachea is removed. A small iodoform gauze pack is then placed, holding the membrane against the cartilage and filling the lumen of the larynx. The end of the pack is brought out through the cricothyroid membrane. The cartilage, subcutaneous tissue and skin are brought together and sutured. The tracheotomy tube is left in position.

The vocal cords in women are quite short, and as most of these cases occur in women, the removal of the vocal process is important as it gives greater anteroposterior dimensions to the lumen and it also allows better apposition of the mucous membrane to the lateral wall.

Postoperative Course.—There is only slight postoperative reaction. The temperature may go as high as 101 F., and some blood-tinged mucus may be coughed from the tube. The patient is allowed a soft diet. The pack is left in place for from four days to a week and is then removed. After the pack is removed, the patient is watched to see that fluids and food do not enter the trachea. The tracheal tube may be plugged, and

if no difficulty ensues, it may be removed. This can be done from two to three days after the pack is removed.

REPORT OF CASES

CASE 1.—Mrs. J. F. B., aged 36, a housewife, came to the clinic on Oct. 21, 1927, complaining of nervousness, tremor and insomnia. The basal metabolism was + 65. The diagnosis was primary hyperthyroidism.

On October 31, a subtotal thyroidectomy was done. On the first postoperative day, the patient was noted to have difficulty in phonation. There was slight stridor but no obvious dyspnea. Her color was good. Examination of her vocal cords by Dr. Tobey showed bilateral abductor paralysis. Examination one week later showed great improvement but not complete abduction. Three months later the action of the vocal cords was normal.

CASE 2.—Mr. R. B., aged 36, came to the clinic on Jan. 11, 1929. His chief complaints were of goiter, palpitation, nervousness and fatigability. The basal metabolism was + 44. Auricular fibrillation was present. On January 24, a subtotal thyroidectomy was done. There was marked bleeding, which was controlled on the left side by folding over the gland, and on the right side the inferior thyroid artery was ligated outside the gland. His voice was normal, and there was no difficulty in breathing following operation. About twenty hours after the operation he had sudden respiratory difficulty with marked stridor and loss of voice. There was a crowing noise on inspiration. Inspection of the wound showed it to be more swollen than on the previous day. He was sent to the operating room, and the wound was opened. The thyroid gland was freed from the larynx except for its posterior aspect. This did not relieve the difficulty in breathing. Examination of the larynx showed that the vocal processes were in apposition; there was a complete abductor paralysis. A tracheotomy was done. Seven days later, January 31, there was some action of the vocal cords. On February 4, both cords were moving well, and the tracheotomy tube was removed. Examination of the larynx, on March 4, showed the action of the arytenoids and cords to be normal.

CASE 3.—Miss J. S., aged 60, came to the clinic on April 21, 1930. She complained of goiter, loss of weight, fatigue, palpitation and nervousness. Her basal metabolism was + 11. The diagnosis was retrotracheal adenomatous goiter.

On April 23, a subtotal thyroidectomy was done. A very large adenomatous lobe with a large retrotracheal portion about 3 inches (7.6 cm.) long was delivered on the right side with some difficulty. This gland was excised in the usual manner. A similar lobe was encountered and delivered on the left side, and the breathing became markedly obstructed. Examination of the larynx showed the vocal cords to be near the midline as in bilateral abductor paralysis. A tracheotomy was done; pneumonia developed, and the patient died from pneumonia and shock thirty-two hours after the operation. A postmortem dissection of the recurrent laryngeal nerves showed them to be uninjured as far as could be determined anatomically. This abductor paralysis would, no doubt, have cleared up had the patient lived. This case is therefore included in the temporary group.

CASE 4.—Miss B. M., aged 40, came to the clinic on June 11, 1926, complaining of difficulty in breathing, recurrent lumps in the neck following a thyroid operation, weakness, nervousness and exophthalmos. She had had a thyroid operation elsewhere eight months previous to admission. Examination of the larynx by Dr. Herman showed bilateral abductor paralysis, and the glottic space was so small that one would expect dyspnea on the slightest exertion.

On June 25, a skin flap was turned up on the right side, and the right recurrent laryngeal nerve was found behind the thyroid remnant. It was followed up to a neuroma just behind the inferior horn of the thyroid cartilage. This was freed, and the upper portion of the nerve was demonstrated beneath the fibers of the inferior constrictor muscle. The neuroma was cut away, and an end-to-end anastomosis of the nerve was made without difficulty and without tension. The wound healed by primary intention. On August 3, the patient was feeling better, her voice was higher pitched, and she was breathing much easier. On October 19, Dr. Herman reported some definite movement in her cord. On June 29, 1927, he reported that the cord moved fully one-half the normal amount.

This patient was seen by me on Dec. 20, 1929. Examination showed the left cord with normal action and abduction, and the right cord with good tension and abduction and adduction about one-fourth that of normal. In this case there was recovery of a recurrent laryngeal nerve that took place over one year and eight months after the primary thyroid operation, and the anastomosis on the right side gave slight motion and good tension to the cords, but far from normal function.

Case 5.—Mr. W. G. S. entered the New England Deaconess Hospital on Nov. 5, 1928. His present illness began about nine months previous to admission, at which time he had a sore throat and became hoarse, and from that time on his throat continued to bother him. About three months previous to admission he felt a constant desire to clear his throat, but he was unable to raise any sputum. Two months previous to admission he began to have difficulty in swallowing. His throat was never painful. Two weeks before admission he became short of breath but had the most trouble with inspiration. The difficulty in breathing continued, the patient was unable to do any work, and he was scarcely able to be about. Examination of the neck showed the thyroid to be firm, hard and irregular, only about one and a half times the normal size on the left side. There was a hard mass of tissue that extended through the soft tissues of the neck nearly to the sternal notch. Laryngeal examination showed edema of the arytenoids and false cords of both sides, and there was only a narrow space in the glottis between the two cords. There was no abductor motion. The obstruction was so severe that there was retraction of the sternal notch and the intercostal spaces. A tracheotomy was done. A hard, irregular, infiltrating mass of tissues of about the consistency of cartilage was encountered in front of and extending across the trachea from the mass on the left side. This was just above the sternal notch. This band of tissue was divided over the trachea and a specimen removed for microscopic examination. The microscopic diagnosis was chronic inflammation of the fibrous tissues. The Wassermann test of the blood was positive, and the patient was given active antisyphilitic treatment.

On November 11, there were considerable reduction in the edema and slight movement of the right vocal cord. The left was still fixed in the midline. On Jan. 25, 1929, the patient had gained 15 pounds (6.8 Kg.) and was feeling very well, and there was good action of the right arytenoid, but the left still did not move. There were still some swelling and edema of the arytenoid region. On February 20, the action of the right cord was normal and there was some abductor action of the left; however, it was not complete. There was no longer any swelling, and the tracheotomy tube was removed.

Case 6.—Miss A. P., aged 45, came to the clinic on Aug. 17, 1928, with a chief complaint of goiter. A diagnosis of multiple colloid adenomatous goiter was made. She was urged to have this removed, as it was unsightly, partly substernal and might become malignant or toxic and cause cardiovascular changes. An operation

performed on August 20 showed the right lobe of the thyroid almost entirely replaced by a very large adenoma that ran behind the clavicle for some distance. It was removed, a small portion of the gland being left behind. The operative diagnosis was adenoma of the right lobe. The pathologic diagnosis was embryonal adenoma with blood vessel invasion (malignant). The patient was given roentgen therapy, and there was no evidence of any growth on December 28. She returned for an examination on Aug. 27, 1929, and there was no evidence of recurrence of the malignant condition, but a note was made that there was some thickening on each side of the trachea. Further roentgen treatment was considered unnecessary. The patient was again seen on December 31, and at this time the thyroid area was firm, and there were no nodules or evidence of recurrence. She then complained, however, of some hoarseness and phlegm in the throat. Laryngeal examination showed the cords slightly irregular, and the motion of the left cord was about one-half normal. Below the cords on the right was a projection from the right wall of the trachea that nearly reached the midline. A diagnosis was made of partial left abductor paralysis and tracheal growth projection from a malignant condition of the thyroid. We advised roentgen treatment of the thyroid region and that the patient be kept under observation in Philadelphia. In Philadelphia a biopsy was made following which a tracheotomy was necessary. Roentgen treatment was given. The patient was seen again Aug. 15, 1930, at which time the tracheotomy tube was in place. On examination of the larynx, the growth in the trachea was found to have increased somewhat in size, and on inspiration, with the tracheal tube closed, the cords came together in the midline. On December 20, some abductor action of the cords was returning. In April, 1931, the action of the cords was normal but the tube was necessary because of tracheal obstruction.

Case 7.—Mrs. D. S., aged 35, came to the clinic in 1924 with a complaint of bilateral abductor paralysis. The history dated back from an operation on the thyroid gland in 1919, at which time a tracheotomy tube was placed. A suture of the hypoglossal and the distal end of the recurrent laryngeal nerve was done on both sides. Following this operation, there was some increase in tension of the cords, and her voice was better. She was last seen on Jan. 11, 1928, by Dr. Herman, who advised her to continue to use the tracheotomy tube.

Case 8.—Mrs. L. S., aged 32, came to the clinic on April 18, 1928, with the complaint of difficulty in breathing following a thyroid operation. Thyroid operations were performed in June, 1926, and November, 1927. She was seen by Dr. Herman, and a diagnosis of bilateral abductor paralysis was made.

On May 3, 1928, an operation was done for the purpose of anastomosing the recurrent laryngeal nerve, but on dissection the distal portion of the nerve could not be demonstrated, making anastomosis impossible. On June 7, two months later, an examination by Dr. Herman showed the condition unchanged.

Case 9.—Mrs. I. K., aged 27, came to the clinic on May 26, 1927, with the complaint of difficulty in breathing and swallowing following a thyroid operation three years before. Examination showed a bilateral abductor paralysis with marked stridor. On June 11, on careful search and dissection, the lower or proximal segment of the recurrent nerve was found to be buried in scar tissue. The distal portion could not be demonstrated. The nerve was freed and a good-sized segment cut away. The superior laryngeal nerve was then identified, and a segment 1 cm. in length was removed. Section of both superior and recurrent nerves of the same side gave very little improvement. The patient is a semi-invalid, and has been unwilling to have a tracheal cannula placed or to undergo further operative procedures.

CASE 10.—Mrs. M. C., aged 43, came to the clinic on May 20, 1930, with the complaint that she was unable to get her breath. She had a history of thyroid operation on July 18, 1928. She lost her voice completely for two weeks, and then the voice gradually returned. At the time of admission to the clinic, she could talk very well, though occasionally the voice became hoarse. The trouble in breathing since the operation had been gradually increasing. She was unable to do any work or to get enough sleep.

Examination showed the vocal cords very near the midline, and a diagnosis of bilateral abductor paralysis was made. The arytenoid cartilages separated easily. A tracheotomy was done. The patient has been so happy with her tracheal cannula that she has been unwilling to undergo any further procedure.

CASE 11.—Mrs. F. C. P., aged 69, came to the clinic on March 13, 1928, with the complaint of goiter and difficulty in breathing. She had a history of having been operated on fifty-seven years previously (in 1870), at which time a fibrous tumor was removed from the left side of her neck, since which time there had been a moderate stridor on breathing. A goiter had been noticed for the past thirty-five years, with gradual growth until fourteen years prior to admission. Roentgenograms showed the trachea narrowed and deviated to the left. A diagnosis of multiple colloid adenomatous goiter and intrathoracic and bilateral abductor paralysis was made. A thyroid operation was performed on March 20. The recurrent nerves were inspected and were thought to be intact throughout their course. There was some improvement in breathing following the operation; however, the glottic opening was still inadequate. The patient continued to have stridor and difficulty in breathing, with fear of suffocation, and she was unable to be about; she consented to a tracheotomy, which was done on May 27, 1929. This was performed following a method described by Dr. McKenty. A short tube had to be used as the tracheal opening showed considerable tendency to contract. Following the operation she gained weight and strength. By using a high collar, she has been able to conceal her tube and to go about gossiping with her friends.

CASE 12.—W., a boy, aged 16, came to the clinic on Aug. 19, 1927, with a history of having had a goiter operation on March 25, 1927. He lost his voice immediately after the operation, and this condition persisted until June. The operation gave relief from thyroid symptoms, but breathing had become increasingly difficult, and a tracheotomy was done on August 6. The tube was kept in for seven days and then removed. The patient made a terrible noise at night and could not sleep.

Examination of the larynx showed the vocal cords in the midline. On October 25, a plastic operation was done on the larynx, in which the anterior portions of the thyroid cartilage were separated, widening it about one-eighth inch (0.3 cm.). Breathing was fairly satisfactory immediately after operation, and a tracheotomy tube was not placed. About four hours after the patient had returned to his room, he suddenly had increased difficulty in breathing. There was definite evidence of severe obstruction. The wound was opened and a tube placed in the larynx, but the heart action decreased, and the patient could not be revived.

CASE 13.—Mrs. M. T., following a thyroid operation in 1917, was unable to speak above a whisper for two years; then the voice gradually returned, and as the voice improved, difficulty in breathing appeared and became progressively worse. Following her thyroid operation she had a spell in which she lost consciousness, and this had occurred again two, four, nine and twelve years after the operation. In the summer of 1930, she began having convulsive movements of her

hands and feet and a rolling sensation, as she described it, of all the muscles of the body. She frequently had spells in which she would foam at the mouth, bite the tongue and often bruise herself, with loss of consciousness.

She came to the clinic in March, 1931, and for the previous five months she had been unable to leave her home because of the convulsive movements. At that time she could scarcely remain quiet in a chair without convulsive seizures of the hands, feet and head.

Examination of the larynx showed a bilateral abductor paralysis, but in this case the cords were not quite to the midline, and also the arytenoids were separated about 2 mm. The patient had less dyspnea than is seen in most cases. She had fairly quiet respiration at night, but her air supply was so limited that she had to do all her work slowly.

The patient was given calcium, and her convulsive movements cleared up. She was told that she could be made to breathe better, but in doing so there would be some injury to her voice. She decided against operation.

CASE 14.—Mr. H. K., aged 36, came to the clinic on Dec. 11, 1929. He said that a tracheotomy had been performed; he could not breathe through the mouth and could talk only in a whisper. One and a half years previously the patient had been in an automobile accident and was struck in the neck by the steering wheel. Aside from some tenderness, he had little trouble until two months after the accident, when swelling developed both externally and internally, requiring a tracheotomy, and for about six months he had had recurrent swelling and a discharge of pus both externally and internally. Examination revealed a high tracheotomy wound so that the tracheal tube was resting against the lower portion of the cricoid cartilage. A portion of the left wing of the thyroid cartilage was gone and there was still a low grade perichondritis. The patient was unable to get any air either in or out through the larynx. Examination showed folds of mucous membrane filling the larynx. The right arytenoid was present; the left could not be seen. On an attempt to breathe with the tube closed, there was no evidence of any abductor motion. A laryngeal dilator could not be passed. A diagnosis of laryngeal stenosis, perichondritis and bilateral abductor paralysis was made. This patient is now under treatment.

CASE 15.—Mrs. L. W., aged 37, came to the clinic on May 9, 1929, with the complaint of hoarseness and difficulty in breathing. On April 10, 1928, a thyroid operation had been performed. Immediately after the operation she could not speak. After five or six days, her voice returned, although it was husky. At times she had difficulty in breathing. This has become progressively more marked until at the time of admission it was very pronounced. She had difficulty on inspiration, could not sleep well, could not lie down flat and had to be careful in eating because she choked easily.

Laryngeal examination showed a bilateral abductor paralysis, and only with difficulty could the arytenoids be pried apart. On May 11, a tracheotomy was performed. On May 27, a submucous resection of the left vocal cord was done. The tracheal tube was removed on June 10. The patient now breathes without difficulty and is able to do her own housework. Her voice is husky, but she has no difficulty in making people understand what she says.

CASE 16.—Mrs. R. D., aged 50, came to the clinic on Oct. 28, 1929. She had many complaints, among them the wearing of a tracheotomy tube. There was a history of goiter operation in July, 1928. Marked difficulty in breathing followed. A tracheotomy was performed. She remained in the hospital for six weeks, and the tube could not be removed.

Examination showed a bilateral abductor paralysis. A submucous resection of the right cord was done on Jan. 28, 1930. A tube was placed in after the method of Schmiegelow. The tube was removed on February 6, following which there was a great deal of increase in the glottic space. On February 8, the tracheal cannula was plugged, but there was slight difficulty in breathing so the tracheal tube was retained. On April 3, examination showed some granulation in the anterior portion of the larynx, and this was removed with a punch forceps. There was no evidence of a left vocal cord, but the soft tissue of the false cord of the right was overhanging the midline. On June 2, the patient reentered the hospital, at which time the left cord could not be seen, the right cord could be seen, and the soft tissue of the right false cord overhung the midline of the larynx. She had other definite evidences of myxedema, and it was thought that part of the swelling of the larynx was due to that condition. The patient was given thyroid extract, and there was considerable improvement of the myxedema generally and also of the larynx. She could breathe with the tube plugged, but it tired her somewhat. On June 19, a second operation was performed; the left side of the larynx showed no projection in the region of the true cord. A submucous resection of the right cord was done. Some soft, fatty, edematous tissue behind the right false cord was removed. A pack was placed in the larynx instead of the tube, as it was thought that it conformed to the irregularities of the lateral wall better than the rubber tube. On June 25, the tracheotomy tube was removed, and up to the present time the patient has had no difficulty in breathing or carrying on her work. She talks with a very loud, hoarse whisper. She has no other difficulty with laryngeal function.

Case 17.—Mrs. A. C., aged 33, came to the clinic on Oct. 23, 1929, with a history of goiter operation in 1915 without difficulty. Another goiter operation fourteen months previously left her hoarse for two or three months after the operation; then she became better. Her breathing was fairly easy and there was some stridor. Her difficulty in breathing had increased during the four or five months prior to her coming to the clinic, at which time she had difficulty getting about, was unable to sleep well, used three pillows at night, and had choking and dyspnea on exertion.

Laryngeal examination showed a bilateral abductor paralysis. The arytenoids were difficult to separate. On October 26, a tracheotomy was performed. On November 6, a laryngeal fissure was done, and the anterior portion of each vocal cord was transplanted laterally. Immediately after the operation the patient had a fair airway. With the postoperative reaction, this decreased, and on December 2, the right cord had almost returned to the midline. The left was displaced laterally, and a granulation appeared in the anterior portion of the larynx. This was a distinct failure, and the tracheal cannula had to be left in place. On Feb. 5, 1930, the patient returned, and examination showed the glottis more narrow than before the previous operation. A submucous resection of each vocal cord was done, and a tube was placed in the larynx after the method of Schmiegelow. On February 19, the tube was removed. Following this she had an ample airway, and the tracheotomy cannula was occluded. She is now doing her own work without the use of the cannula. Her voice is hoarse, but she thinks that it is nearly as good as before the thyroid operation.

Case 18.—Mrs. H. M., aged 35, came to the clinic on Nov. 14, 1930, with a chief complaint of attacks of difficulty in getting her breath. She had had a thyroid operation sixteen months previously. She felt very well following operation, but could not talk above a whisper for the next seven months. She had difficulty in swallowing, and she had gained some weight. The year previous to admission she lost 20 pounds (9 Kg.), which she attributed to loss of sleep. Nine months previously,

she had a spasm lasting for fifteen minutes, during which she could scarcely get her breath. She made a roaring noise when she slept and could sleep only in short naps. One month previous to admission to the clinic a tracheotomy was performed for another spasm. The tube was left in place for one week, and was then removed.

Examination showed a typical bilateral abductor paralysis. On November 15, a tracheotomy was performed. There was difficulty in separating the arytenoids. On November 22, a submucous resection of the left cord was done. The laryngeal pack was removed four days after the operation. The tracheal cannula was removed one week after the operation. There has been no difficulty in breathing since. She had since gained 25 pounds (11.3 Kg.). She has no difficulty in eating or swallowing and is able to work. She talks in a hoarse whisper, but at times has a fair voice.

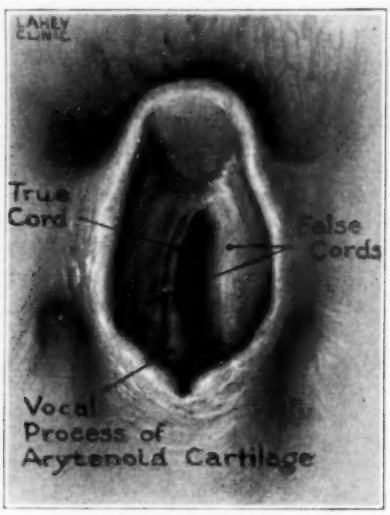

Fig. 7 (case 18).—Seven months after the removal of one vocal cord.

SUMMARY

There are six cases of temporary bilateral abductor paralysis in this series; three of the six were produced at the clinic. In one partial function returned within a week, and in three months the function was normal. In the second case the paralysis occurred about twenty hours after operation, evidently due to swelling or pressure from bleeding. A tracheotomy was necessary, and here again partial function returned within a week and complete function returned within two months. The third patient died of pneumonia and shock thirty-two hours after operation, but a postmortem dissection disclosed the recurrent nerve to be uninjured. In case 4 the operation was done elsewhere, and we saw the patient eight months after operation; there was a spontaneous recovery of function of one vocal cord twenty months after the original operation. In case 5 the patient had a syphilitic thyroiditis

with syphilitic infiltration of the neck and syphilitic perichondritis with bilateral abductor paralysis. There was recovery of function of one cord and partial function of the other under antisyphilitic treatment following the tracheotomy. In case 6, in which there was malignant thyroid disease, a tracheotomy became necessary and a bilateral paralysis resulted. Return of function followed roentgen treatments to the thyroid.

From these cases it is readily seen that paralysis may be caused by pressure or stretching of the recurrent nerves without actual crushing or cutting.

In two cases the patients had plastic operations on the larynx to widen the anterior portion, both of which were failures. One of these patients died of suffocation.

An attempt at recurrent anastomosis was made in four cases. The operation was technically impossible in two because the distal portion of the recurrent nerve could not be demonstrated. In one of these two cases the superior laryngeal nerve was severed on one side without apparent improvement. In one case there was an end-to-end anastomosis of the recurrent laryngeal nerve eight months following thyroid operation. There was a good temporary recovery of function. In one case there was a bilateral hypoglossal recurrent laryngeal anastomosis five years after the thyroid operation that failed.

Three patients rely on a tracheotomy tube for relief from bilateral abductor paralysis, and these patients have been much happier with the tube than they were previous to the placing of the tube. Two patients rely on the tube because of laryngeal and tracheal stenosis due to some other cause. In one case there was no attempt at treatment for the abductor paralysis. Four patients were relieved by submucous resection of the vocal cords, one has a satisfactory voice, and the other three have hoarse whispers; all have satisfactory airways.

Therefore, at the present time, of the eighteen patients seen, one died of suffocation after operation for stenosis, one died of other causes (pneumonia and shock), five are wearing tracheotomy tubes, four have recovered, three have not been relieved and four have been relieved by submucous resections of the vocal cords.

Submucous resection of the cords is a relatively safe and certain method of overcoming the obstruction of bilateral abductor paralysis.

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INTRACRANIAL COMPLICATIONS OF OTITIC ORIGIN *

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In the last few years increasing emphasis has been placed on that portion of the field of otologic surgery which might be considered to concern itself with efforts to prevent intracranial extension of middle ear and mastoid suppuration. It is understood, of course, that the surgical treatment of the infected ear and mastoid is in itself an attempt along these lines. However, with the increase of our knowledge of the spread of infection from the ear and mastoid there has developed *pari passu* a broadening of the limits of surgical exploration so that exenteration of the cells in the mastoid does not always suffice. While it is true that in most instances of mastoid disease the complete removal of all cellular elements is all that is essential for recovery, there are instances in which further exploratory measures must be instituted.

It must be obvious that in order to establish a rational basis for the exploration of structures beyond the mastoid, we must lay as a foundation a thorough understanding of the pathologic changes and the pathways along which these changes progress. The literature contains comparatively few such studies.

Realizing the importance of this problem, we have, for the past four years, carefully prepared and studied histologically a considerable number of temporal bones illustrative of the various pathways of intracranial extension. Occasionally in the routine removal of temporal bones we obtained specimens that demonstrated possible pathways of infection, such as dehiscences in the bony jugular dome (fig. 1) and middle fossa, open sutures (fig. 2) and erosion of the facial canal (fig. 3) in patients who died of entirely unrelated diseases.

An infection beginning in the middle ear may extend through various routes and involve a variety of structures. Thus middle ear or mastoid disease may involve the intracranial contents by bone necrosis or through sutures, dehiscences, perforating vessels or lymphatics.

When we have accumulated sufficient material to be able to make authoritative statements, we mean to divide the presentation anatomi-

* Submitted for publication, Sept. 8, 1931.

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cally into cases illustrating extension of middle ear or antrum infection to the middle fossa and those illustrating extension to the posterior fossa, grouping separately the cases of sinus thrombosis (those illustrating infection in the middle ear directly to the jugular bulb). It is obvious, for instance, with regard to sinus disease that a rigid separation of the two types mentioned may be impossible, viz., that one may follow the other: cases in which the infection spreads into the petrous pyramid, cases of suppurative labyrinthitis being grouped separately, and cases in which the infection spreads into the zygoma. The end-results of infectious spreading along the pathways mentioned vary, depending on factors concerning which there is little or no definite knowledge. The virulence of the infectious agent, the rapidity of the extension and the lack of resistance on the part of the host are perhaps only paraphrases of that peculiar lack of ability to limit infections which is present in some persons. Thus there may result extradural abscess, intradural abscess, brain abscess or meningitis, localized or diffuse.

The following résumés are brief accounts of the salient features in the clinical course of cases the histologic slides of which will be demonstrated, illustrating various pathways of the spread of infection:

REPORT OF CASES

CASE 1.—*Abscess of the left temporal lobe of the brain secondary to zygomatic perforation.*

A. G., the patient, a 6 year old boy, was admitted to the pediatric service with a history of headache and pain in the left ear for one week. Physical examination revealed evidence of meningitis, which was proved by lumbar puncture. The patient was given antimeningococcus serum because of the presence of intracellular and extracellular organisms suggestive of meningococci. The inflammation in the ear was resolved, and the patient apparently recovered. Six months later, he was readmitted. He had been perfectly well until seventeen days before admission, when he suddenly vomited. Three days later there was pain in the left ear. A myringotomy was performed. There was a discharge from the ear for nine days; headache and again vomiting were noted. On the patient's admission the ears were normal. Lumbar puncture again revealed meningitis. The fundi showed papilledema, and it was noted that the patient had right homonymous hemianopia. A diagnosis of temporosphenoidal lobe abscess was made. The patient developed convulsive seizures and coma and died.

On postmortem examination, a circular area on the inner aspect of the zygoma was observed, with adherent meninges and sievelike perforations of the dura, which was thickened and inflamed (figs. 4 and 5). The cavity of the middle ear, epitympanum and perilabyrinthine cells were infiltrated with small lymphocytes and large giant cells. A thickened mucosa was seen in the tympanum. The inflammatory process became more and more marked in the cells of the roof of the antrum and in the zygomatic process. Some of the cells were in direct communication with the dura through granulations and blood vessels. There was necrosis of the inner aspect of the zygoma. Large lacunae and resorption spaces lined with

osteoclasts were seen. There were islands of new bone formation. The dura of the middle fossa was thickened to five or six times its normal size.

CASE 2.—*Extradural abscess; temporosphenoidal lobe abscess; meningitis.*

N. G., the patient, 26 years old, following swimming developed an acute otitis which required myringotomy. Four weeks later the patient had a simple mastoidectomy. A culture of the pus from the mastoid at this time was reported as showing pneumococcus type III. Following operation, ocular changes (blurring of the disks) which progressed, a slow pulse rate, vomiting and headache were noted. After lumbar puncture showed a clear fluid under markedly increased pressure, an exploratory operation was performed. About 1 ounce (28.3 cm.) of

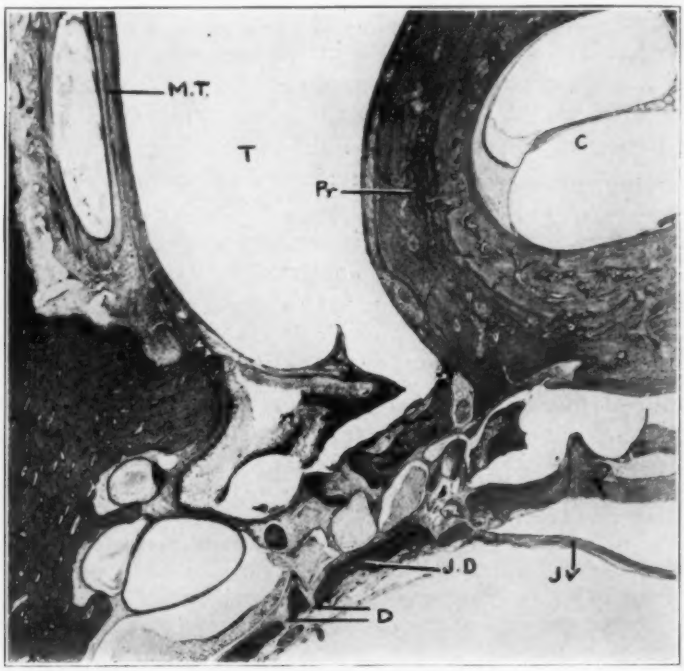

Fig. 1.—Section through the tympanum, showing dehiscenses of the jugular dome. *C*, cochlea. *D*, dehiscence, *J. D*, jugular dome. *Jv*, jugular vein. M.T., membrana tympani. *Pr*, promontory. *T*, tympanum.

greenish-yellow pus was obtained. The next day the patient developed purulent meningitis and died.

Post mortem, the temporal bone showed grossly a healing mastoid cavity and a thickened dura over the antrum, but nothing else pathologic. The brain revealed a circumscribed temporal lobe abscess. Histologic examination of the temporal bone showed: 1. There was a purulent secretion in the middle ear and antrum. 2. The mucosal lining of the tympanum, antrum and adjacent cells of the petrous pyramid was thickened and inflamed. 3. The dura over the antrum was inflamed and thickened. 4. This inflammatory change extended along the supralabyrinthine cells toward the posterior fossa. 5. At the superior posterior margin of the petrous pyramid, behind the vestibule, was a large abscess beneath the cortex, with

necrosis of the bony septums, as evidenced by numerous osteoclasts that lined the large resorption spaces. 6. There was perforation of the cortex of the middle fossa with the formation of sequestrums. 7. A huge subdural collection of pus was present. 8. The dura was thickened to seven times its normal thickness. 9. A large intradural abscess was also present. 10. There were thrombosed vessels in the dura (fig. 6).

CASE 3.—*Cerebellar abscess.*

B. R., the patient, an 8 year old boy, was admitted to the neurologic service with a history of otitis media on the right side and mastoiditis following scarlet fever eleven weeks before. Mastoidectomy had been done. The wound had healed, and the inflammation of the middle ear had resolved. One week before admission he had had severe frontal headache, with vomiting, pain over the right eye, a

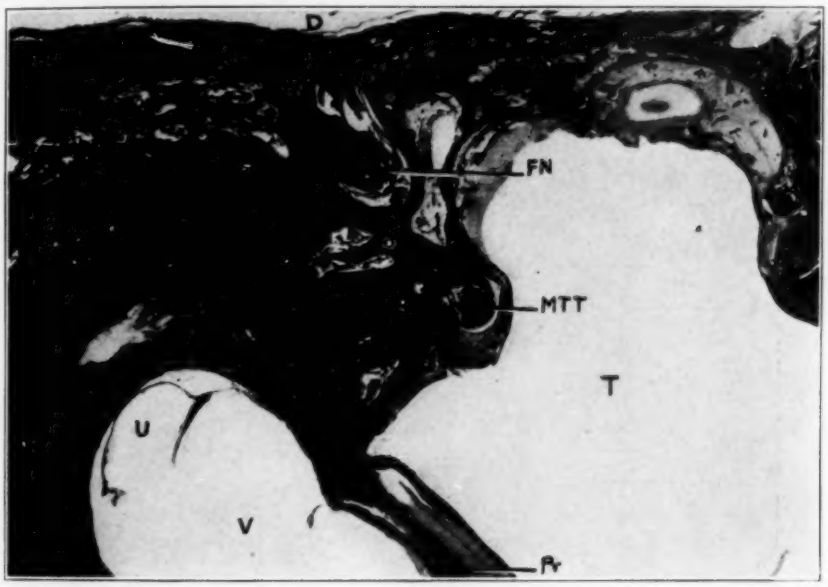

Fig. 2.—Section through the tympanum, showing dehiscence of the bone over the roof of the fallopian canal at *D*. The facial nerve is in contact with the dura. *FN*, facial nerve. *MTT*, muscle tensor tympani. *Pr*, promontory. *T*, tympanum. *U*, utricle. *V*, vestibule.

temperature of 101 F., drowsiness, absence of the abdominal reflexes, nystagmus to the right, right-sided ataxia and spontaneous past pointing. The disks were blurred. A diagnosis of right cerebellar abscess was made. A craniotomy was performed; 40 cc. of pus was evacuated from the cerebellar abscess. A culture was reported as showing Streptococcus hemolyticus. The patient's condition was markedly improved following the operation. He was discharged from the hospital. Seven weeks later he was readmitted because of the recurrence of cerebellar signs and symptoms. A second operation was performed. Pus was again evacuated. A drainage tube was inserted. The patient became drowsy and stuporous and died.

Postmortem examination revealed, grossly, a defect in the cortex (2 by 1 cm.) on the posterior margin of the petrous pyramid on the right side. The defect was close to the internal auditory meatus and seemed to communicate with it (fig. 7).

The adjacent bone was necrotic and friable. The dura here was grossly perforated, inflamed and separated from the underlying bone. The brain showed evidence of increased intracranial pressure and a cerebellar abscess. Histologic examination of a section of the petrous pyramid revealed: (1) a defect in the cortex of the bone in the region of the internal auditory meatus, and a sequestrum; (2) thickening and inflammation of the periosteum (dura) lining the internal auditory meatus; (3) an intact labyrinth, and (4) slight or no inflammatory change of the middle ear and mastoid.

CASE 4—*Osteitis of the petrous pyramid.*

S. L., the patient, a woman, 32 years old, gave a history of grip two months before examination followed by otitis media. Myringotomy and later a simple

Fig. 3.—Section through the tympanum, showing necrosis of the fallopian canal with purulent exudate about the facial nerve. *C*, cochlea. *FN*, facial nerve. *M*, malleus. *PE*, purulent exudate. *Pr*, promontory. *St*, stapes. *T*, tympanum. *U*, utricle. *V*, vestibule.

mastoidectomy were performed at another hospital. Following the operation the patient had a severe headache (temporoparietal), chills, projectile vomiting and a temperature of 103 F. A negative blood culture was obtained. Examination of the spinal fluid revealed 600 cells. No organisms were revealed on smear or culture. There was involvement of the fifth (sensory and motor), left sixth and left peripheral seventh nerves with impaired hearing on the left side. There was a question as to whether we were dealing with abscess of the brain or osteitis of the petrous pyramid. Exploratory craniotomy for abscess of the brain was done, with negative observations. The patient went rapidly downhill and died. Streptococcus hemolyticus was recovered from the spinal fluid.

Postmortem examination showed purulent meningitis. Grossly the petrous pyramid was normal. Histologic section showed: 1. Pneumatic cells were seen about the mastoid antrum, and in the epitympanum showed acute inflammation. 2. The mucosal lining was thickened and infiltrated. 3. Cells showing infiammatory changes could be traced from the epitympanic cells to adjacent cells along the

Fig. 4.—Gross specimen of the temporal bone, showing an oval area of necrosis of the squama on the inner aspect of the root of the zygoma. *A*, area of necrosis

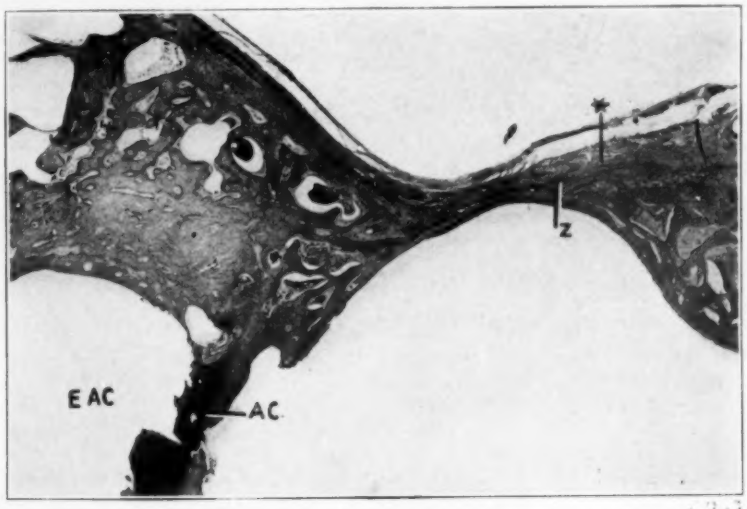

Fig. 5.—Section through the necrotic area of figure 7, showing necrosis (star) of the bone of the zygoma, inflammation about the pneumatic cells and a marked inflammatory reaction of the adjacent dura. *AC*, anterior canal wall. *EAC*, external auditory canal. *Z*, zygoma.

floor of the middle fossa, superficial to the superior semicircular canal but not involving the bony labyrinthine capsule, extending posteriorly almost to the posterior fossa and below the horizontal portion of the facial nerve. 4. The inflammatory changes were more severe in this region than in the antral region. 5. In the

region of the cochlea, the changes in the cells superior to the bony labyrinth were even more marked. 6. In the region of the angle between the superior and posterior surfaces of the petrous pyramid, at about the depth of the internal auditory meatus and near the superior petral sinus, the bony cortex was necrosed and the overlying dura was secondarily involved, resulting in meningitis.

CASE 5.—*Osteitis of the petrous pyramid; deep subdural abscess; meningitis.*

L. S., the patient, a 5 year old girl, had had a chronic discharge from the ears for three and a half years. Two months prior to admission to the hospital she underwent mastoidectomy at another hospital. Two weeks before admission she had headache, vomiting, a temperature of 102 F., paralysis of the left sixth nerve and evidence of meningitis. A lumbar puncture revealed turbid fluid. Streptococcus

Fig. 6.—Section through the petrous pyramid, showing marked destruction of bone at the superior posterior angle, with sequestration of bone and the production of an extradural abscess. *A*, area of necrosis. *D*, dura. *EA*, extradural abscess. *S*, sequestrum of bone. *U*, utricle. *V*, vestibule.

hemolyticus was obtained on smear and culture. The patient died two days after operation.

Postmortem examination showed: 1. Meningitis was present. 2. In the region of the internal auditory meatus superiorly and posteriorly the dura felt thickened and bulged. Palpation revealed the presence of fluid between the dura and the underlying bone. The diagnosis of deep subdural abscess was made. No gross changes were noted at the apex of the petrous pyramid.

Histologic sections showed: 1. The inflammatory process extended by direct contiguity through the cells (antrum, epitympanum) as far as the bony labyrinth below and almost to the posterior margin of the pyramid. 2. At the depth of the

internal auditory meatus there was marked necrosis of bone (osteoclasts, etc.). 3. The disease here had eroded the bone, undermining the dura, with the formation of an extradural abscess (fig. 8).

CASE 6.—*Syphilis with meningitis and secondary retrograde labyrinthitis in a child.*

The patient, an acutely ill child, was admitted to the pediatric service with a history of convulsions, diarrhea and vomiting for six days. The ears were normal. No nystagmus was present. There was evidence of meningitis: a rigid neck and a bilateral Kernig sign. A blood culture was positive for Streptococcus viridans. The Wassermann reaction was 4 plus. The patient rapidly became worse, and died

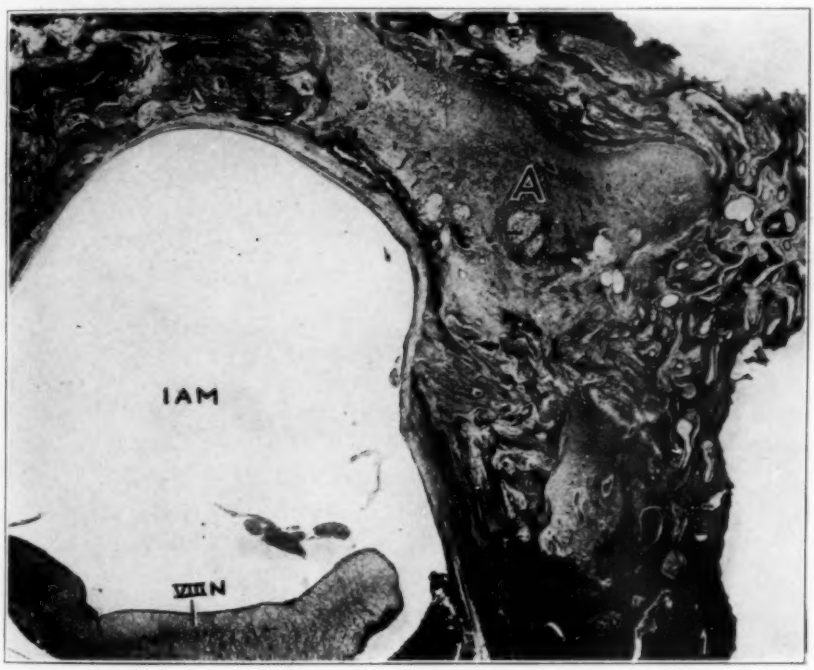

Fig. 7.—Marked destruction of bone in close proximity to the internal auditory meatus. *A*, area of bone necrosis. *IAM*, internal auditory meatus. *VIIIN*, eighth nerve.

twenty-four hours after admission. (In this case, because of the lack of microscopic evidence of disease in the middle ear, it is fair to assume that the meningitis was not of otitic origin. Here it was probably labyrinthitis secondary to meningitis via the internal auditory meatus.)

Histologic slides showed: 1. In the cavity of the middle ear there was only a slight purulent exudate. 2. Both windows were intact. 3. Purulent and hemorrhagic infiltration was noted in the perilymphatic spaces, particularly in the basal turn of the cochlea, the scala tympani and the vestibule. 4. Considerable purulent and hemorrhagic infiltration was present in the internal auditory meatus about the

main blood vessels and nerves. The purulent exudate could be traced into the modiolus and into Rosenthal's canal, making its entrance into the membranous labyrinth.

CASE 7.—*Sinus thrombosis; meningitis.*

E. B., the patient, a girl, 12 years old, was admitted with evidence of an acute mastoiditis. A simple mastoidectomy was done. The postoperative course was uneventful until the sixth day, when the patient had a chill and a rise in temperature to 105 F. A blood culture taken at that time was reported positive for Streptococcus hemolyticus. A lumbar puncture revealed pleocytosis but no organisms on smear. A sinus and jugular operation was performed. Two days later the preoperative lumbar puncture fluid was reported positive for Streptococcus hemolyticus on culture. The patient went downhill and died of meningitis.

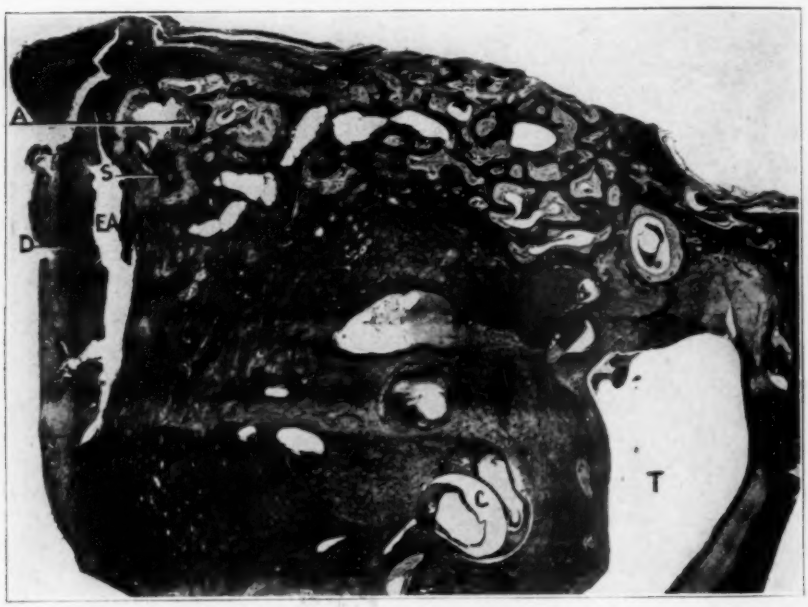

Fig. 8.—Section through the petrous pyramid, showing marked inflammatory reaction in the pneumatic cells along its superior margin with bone destruction and sequestration and with the production of a large extradural abscess along the posterior border. *A*, area showing marked inflammatory reaction. *C*, cochlea. *D*, dura. *EA*, extradural abscess. *S*, sequestrum of bone.

Postmortem examination revealed a purulent exudate in the middle ear and antrum and considerable exudate in the hypotympanum. There was necrosis of the jugular dome. The jugular vein showed a marked thickening with severe inflammatory changes (fig. 9). A thrombus was present. The cells adjacent to the antrum contained a purulent exudate. The sigmoid sinus showed signs of phlebitis and thrombosis.

CASE 8.—*Labyrinthitis; meningitis.*

E. C., the patient, a woman, 42 years old, was admitted to the otologic service with a history of headache, fever, nausea, vertigo and vomiting. There had been a discharge from the left ear for two weeks. For many years the patient had been deaf in the left ear, and hearing tests revealed complete loss of hearing. Rotary

nystagmus to the right was present. The spleen was palpable. The patient had a chill, with a sudden rise in temperature to 104 F. A blood culture taken at this time was positive for Streptococcus hemolyticus. While in the hospital the patient developed metastatic foci in the joints and white-centered petechiae in the skin and in the mucous membranes of the eye. An Ottenberg culture revealed 10 and 11 colonies in the internal jugular veins. The diagnosis was acute endocarditis and not a general invasion of otitic origin. The patient soon became very ill; Streptococcus hemolyticus was found in the spinal fluid, and death occurred.

Postmortem examination revealed: mastoiditis on the left side, acute endocarditis with vegetations on the mitral valve, meningitis and no sinus thrombosis;

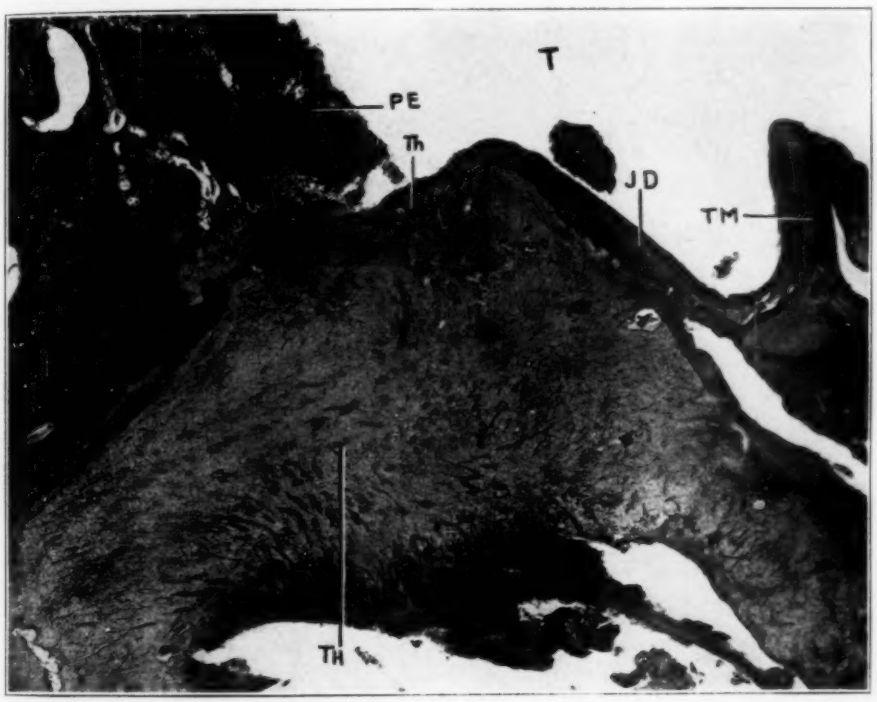

Fig. 9.—Section through the hypotympanum, showing partial necrosis of the jugular dome and communication of the infection of the hypotympanum with the jugular vein. The vein is markedly thickened and thrombosed. A purulent exudate can be seen within the lumen. *JD*, jugular dome. *PE*, purulent exudate. *T*, tympanum. *TH*, thrombus. *TM*, tympanic membrane.

there were abscesses in the kidneys. There was no evidence of phlebitis of the bulb or lateral sinus thrombosis. Histologic sections showed: 1. There was pus in the mastoid cells. 2. The middle ear cavity contained purulent exudate. 3. The bony promontory showed a resorptive process as evidenced by granulation tissue and osteoclasts. 4. Pus and granulations could be seen invading the membrana secundaria of the round window, actually perforating it and entering the scala tympani. 5. There was destruction through the stapes and extending into

the vestibule (fig. 10). 6. A serous exudate was observed in the ductus cochlearis. 7. The semicircular canals, utricle and saccule were also involved to a lesser degree.

CASE 9.—*Type III pneumococcus mastoiditis; epidural abscess; meningitis.*

A. G., the patient, had an infection of the upper respiratory tract three weeks before admission to the hospital. One week later a spontaneous discharge occurred from the middle ear and the patient had a severe constant right temporal headache. On admission, the diagnosis of mastoiditis was made and a simple mastoidectomy was performed. A culture of the pus from the mastoid revealed pneumococcus type III. Following operation the patient still complained of severe headache and had a slow pulse rate and mild meningeal signs. The fundi were normal. A lum-

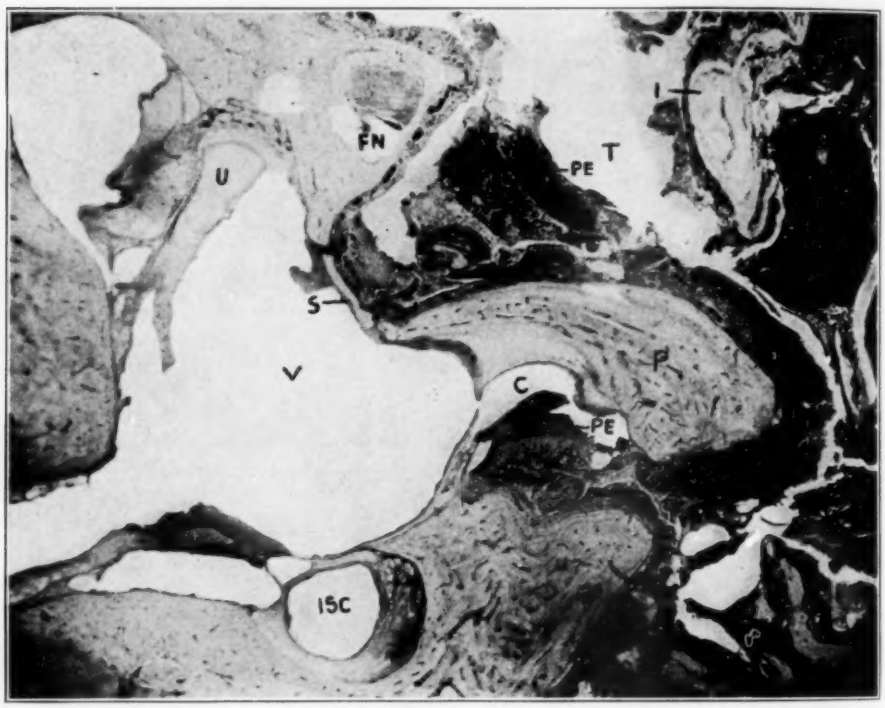

Fig. 10.—Section through the tympanum, showing purulent exudate within the tympanic cavity and at its entrances into the vestibule and cochlea through the oval and round windows, with the production of labyrinthitis. *C*, cochlea. *FN*, facial nerve. *I*, incus. *ISC*, inferior semicircular canal. *P*, promontory. *PE*, purulent exudate. *T*, tympanum. *U*, utricle. *V*, vestibule.

bar puncture showed a turbid fluid containing 5,800 cells. Smear and culture gave positive results. The patient was given pneumococcus type III concentrated serum directly into the internal carotid artery, besides a cisternal injection and lumbar drainage. This seemed to alter the course only slightly, and the patient died, almost a month after his admission to the hospital.

On gross inspection a punched-out oval defect, measuring about 3 by 2 mm., was seen in the dura over the roof of the antrum. Through this perforation granulomas protruded. Histologic sections have not yet been made.

CONCLUSIONS

Although it is obvious that our material is entirely too recent to warrant conclusions, we should like to draw attention to the frequency with which disease extending from the middle ear and mastoid becomes localized about the posterosuperior portion of the pyramid. A bone focus at this site may develop a brain abscess in either the posterior or the middle fossa or a meningitis.

The otologic surgeon must be equipped as a cranial surgeon as well. We believe, from our limited experience with it, that with a technic such as Eagleton has described these foci might have been exposed. Furthermore, the question has again been raised whether exploration of the brain might not have been attended with better results had it been made through such an exposure.

PULMONARY METASTASIS FROM HYPERNEPHROMA DIAGNOSED BY BRONCHOSCOPY *

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Pulmonary metastasis from hypernephroma usually consists of annular masses scattered throughout both lungs. These masses rarely give rise to pulmonary symptoms, and unless there is extension to the

Fig. 1.—Primary hypernephroma.

pleura, with development of pleural effusion, they seldom produce signs that can be detected by general examination. Extension of a tumor of this type into the lumen of a bronchus, with production of bronchostenosis and other signs and symptoms simulating primary bronchial carcinoma, is sufficiently rare to warrant the following report:

REPORT OF CASE

A man, aged 58, was first examined at the Mayo Clinic on May 24, 1928. He complained chiefly of intermittent hematuria of six years' duration. There were no symptoms referable to the respiratory system, and general and roentgenographic examination of the thorax did not reveal anything abnormal.

* Submitted for publication, Aug. 8, 1931.

Fig. 2.—Infiltration at the base of the right lung.

Fig. 3.—Tissue removed from the bronchus.

Tumor of the left kidney was diagnosed. At operation, June 7, the organ was found to be about five times the normal size, and a hypernephroma (fig. 1) was found, which had extended into the perirenal tissues and renal vein.

The patient's convalescence was uneventful, and he was well for about two years. On June 4, 1931, he returned for examination, stating that for about a year he had had a cough, with a feeling of irritation in the throat, and indefinite pain on the left side of the tongue and in the region of the right axilla. The cough had frequently been productive of blood-streaked sputum, and in January, 1931, he had coughed up several teaspoonfuls of bright red blood. Soon after this, fever, increased coughing and progressive loss of 25 pounds (11.3 Kg.) in weight occurred.

Examination of the thorax revealed a region of infiltration at the base of the right lung, with absence of breath sounds. Roentgenograms gave evidence of dense thickening of the pleura on the right side, with adhesions to the diaphragm (fig. 2). It was thought that the pulmonary lesion represented a malignant growth, primary in the bronchus and not related to the renal tumor that had been removed previously. Bronchoscopic examination on June 6 disclosed an ulcerating, bleeding lesion, occluding the bronchus to the lower lobe of the right lung. A specimen of tissue removed for microscopic examination was found to be adenocarcinoma of the type of hypernephroma (fig. 3).

THE VALUE OF ROENTGENOLOGIC EXAMINATION OF THE NECK*

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Roentgenologic examination of the neck has been found to be of considerable practical value in the diagnosis, understanding and treatment of diseases of the nose and throat. Although many reports on this type of examination are to be found in the literature, it is only in recent years that the aid which it offers has been appreciated. It is only since 1929, when the present study was begun at the Massachusetts General Hospital in Boston (direction of Dr. George W. Holmes), that several articles on the subject have appeared. Most of the clinical material for the present study has been obtained through the close cooperation of Dr. Mervin C. Myerson from the laryngologic service of Dr. Sidney Yankauer at Mount Sinai Hospital.

TECHNIC

It has been found best to seat the patient in the usual position for a lateral view of the cervical vertebrae, the head in midposition and the shoulders depressed, when making the roentgen examination. A distance of 6 feet (182.8 cm.) from the x-ray tube to the cassette is used, and the cassette-holder rests on the shoulder of the patient. Exposures of both sides of the neck are made with the patient holding his breath in moderately deep inspiration. True lateral views are thus obtained. Anteroposterior views are made only when there are special indications, as, for example, in studies of the piriform sinuses or in cases of extrinsic pressure on the trachea. The exposure usually necessary for the lateral view, with 88 kilovolts and 100 ma., is from 0.2 to 0.5 seconds. In some cases the use of 98 kilovolts and 350 ma., with an exposure of one twentieth to one thirtieth of a second, has given good results. In this way the "flash" technic suggested by Hickey[1] is combined with our preference for the 6 foot distance. It is felt that the latter provides a definite advantage because magnification and distortion are reduced to a minimum; in addition, this is often the only way of obtaining a view of most of the trachea in short-necked persons. In a few

* Submitted for publication, July 28, 1931.

* From the Department of Radiology, Mount Sinai Hospital, service of Dr. Leopold Jaches.

* Read by invitation at the meeting of the Medical Society of the County of Kings, Section on Otolaryngology, May 13, 1931.

1. Hickey, P. M.: Radiography of the Normal Larynx, Radiology **11**:409, 1928.

cases the use of the "kidney" cassette, described by Benjamin,[2] placed against the side of the neck has given films of improved detail in some doubtful cases. Fluoroscopy often offers considerable aid. Special attention should be paid to the movements of the vocal cords, as suggested by Pancoast.[3] When barium sulphate is used to outline the pharynx or esophagus, or when swallowing movements are studied, fluoroscopy is essential.

NORMAL APPEARANCES

The appearance of the cervical structures varies greatly with sex and age. Individual variations are quite marked in this region. According to Köhler [4] the thyroid cartilage appears at the seventh year and the cricoid at the eleventh. Calcification of the laryngeal cartilages may appear at the fifteenth year. The arytenoids never calcify before the twentieth year, usually starting at the base. The calcification is apt to be irregular, and may confuse the picture. It is not our intention to make a systematic review of the normal variations in this report. For this information reference should be made to the articles of Hay,[5] Pancoast,[6] Thost [7] and Scheier.[8] What constitutes the normal picture of the neck can only be determined after individual study of a considerable number of films; lengthy descriptions do not to any extent facilitate the acquisition of this knowledge. Figure 1 shows lateral views of normal patients in comparison with a side view of the anatomic specimen.

We have noted that the laryngeal ventricle is well seen on the films in about half of the cases. It is visualized in the form of a "boat" or "Zeppelin," as described by Pancoast. Hay's observations bear this out. He noted that the "boat" was present in all of his female patients, but in only 50 per cent of the males. The explanation that he offered was that the laryngeal ventricles may normally be collapsed in the male.

The passage of barium sulphate given by mouth has long been carefully studied by roentgenologists during fluoroscopy in gastro-intestinal cases. Scheier and Iglauer first obtained roentgenograms demonstrating

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2. Benjamin, E. W.: Notes on the Technique of X-Ray Control in the Operating Room, J. Urol. **25**:165, 1931.

3. Pancoast, H. K.: Roentgenographic Anatomy and Physiology of the Larynx and Adjacent Structures, Arch. Otolaryng. **13**:775 (May) 1931; Roentgenology of the Upper Respiratory Tract with Especial Reference to Larynx and Adjacent Structures, J. A. M. A. **95**:1318 (Nov. 1) 1930.

4. Köhler, A.: Roentgenology, translated by A. Trumbull, New York, William Wood & Company, 1929.

5. Hay, P. D.: The Neck, Ann. Roentgenol. **9**:1, 1930.

6. Pancoast (footnote 3, first reference).

7. Thost, A.: Archiv und Atlas des normalen und kranken Kehlkopfs des Lebenden im Röentgenbild, Fortschr. a. d. Geb. d. Röntgenstrahlen, 1913, p. 31.

8. Scheier, M.: Zur Physiologie des Schluckakts, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **4**:115, 1910.

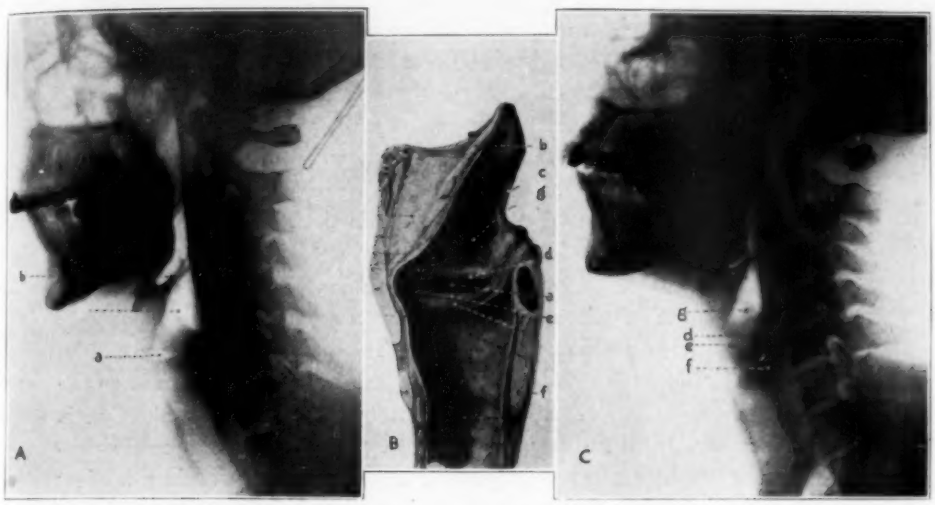

Fig. 1.—Lateral views (*A, B*) of the neck in normal persons in comparison with a lateral view (*C*) of the anatomic specimen (after Spalteholz): *a*, ventriculus laryngis (morganii); *b*, cartilago epiglottica; *c*, plica aryepiglottica; *d*, plica ventricularis; *e*, plica vocalis; *f*, lamina cartilaginis cricoideae, and *g*, vestibulum laryngis.

Fig. 2.—Lateral view of the neck after the ingestion of barium sulphate demonstrating the normal contour of the pharynx.

this passage. Figure 2 shows the normal pharynx and upper part of the esophagus well outlined. In about one third of normal persons a very small amount of barium sulphate remains in the most dependent portions of the piriform sinuses for a considerable period of time. Often these deposits are not displaced immediately by swallowing water, and there is then the danger of erroneously diagnosing the presence of a foreign body. The fact that the piriform sinuses remain well filled for many hours in cases of bulbar palsy is of value in the differential diagnosis. In a few normal persons some barium sulphate is retained in the epiglottic valleculae, particularly when these fossae are deep.

A systematic study of the roentgenographic appearance of the neck in various diseases of the nose and throat has already been adequately made in the articles already referred to. The case reports here will be grouped rather according to the aid that this examination offers to the clinician. First are those cases in which the roentgen examination is often an essential, and always a valuable, part of the diagnostic procedures, for example, retropharyngeal abscesses and foreign bodies; second, those in which the roentgen examination is in a sense confirmatory and often is of particular aid in determining the extent or progress of the lesion when this cannot be determined by either direct or indirect laryngoscopy; this group includes inflammatory and neoplastic conditions of the larynx and hypopharynx; third, those obscure cases in which the value of the roentgen examination depends on the features of the individual case and the degree of cooperation between laryngologist and roentgenologist.

RETROPHARYNGEAL ABSCESSES; FOREIGN BODIES

The diagnosis of retropharyngeal abscess, usually occurring in children, is easily made by noting the marked widening of the retropharyngeal space (fig. 3). With the width of the fifth cervical vertebral body as an arbitrary standard of measurement, called C by Hay, the retropharyngeal space is not larger than 0.2 C in adults nor larger than 1.0 C in infants. Small variations from these figures have not been regarded as significant by us; when a pathologic widening occurs, there is rarely need for exact measurement. Retro-esophageal abscess, which is most frequently due to osteomyelitis of the vertebra, when not due to foreign body or tumor is often undiagnosed until demonstrated by roentgenography; a widening of the retro-esophageal space is the diagnostic criterion with the demonstration of a diseased vertebra.

Confirmation of the presence of foreign bodies and their more exact localization is a well known roentgenologic procedure. When the bodies are radiopaque, as, for example, radium needles, safety pins, coins and often meat bones, they are directly demonstrated on the films. When they are not radiopaque, and this group includes most fishbones, there

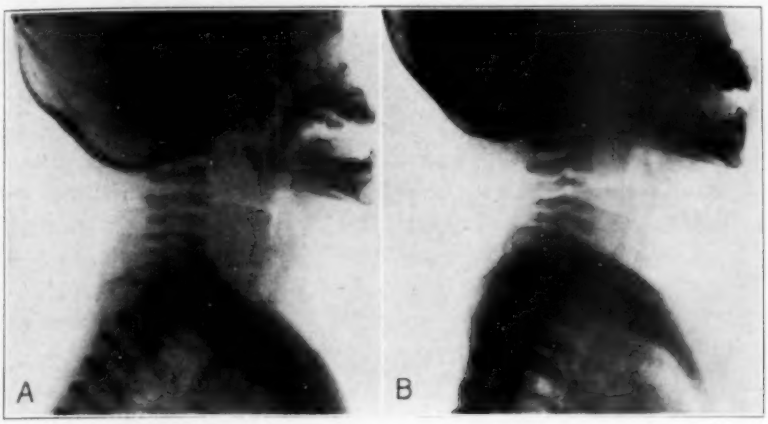

Fig. 3.—Retropharyngeal abscess in an infant, before (*A*) and after (*B*) the evacuation of a considerable amount of pus.

Fig. 4.—A patient with streptococcic laryngitis, showing marked edema of the epiglottis and right arytenoid.

is indirect evidence consisting of partial obstruction to the passage of barium sulphate and coating of the foreign body by barium sulphate which sticks during its passage down the esophagus. Of particular importance, too, is the widening of the retro-esophageal space, indicating the presence of periesophageal edema or inflammation. Often the infiltration is sufficient to widen the retrotracheal space, an observation that can be made from the plain film, without the use of barium to delineate the esophagus. When this is measured between the posterior margin of the trachea and the anterior surface of the fifth and sixth cervical vertebrae, the distance is normally about 0.8 C in adults and 2.0 C in infants. In cases of perforation of the esophagus by a foreign body, a collection of air may be seen in the retro-esophageal space. The sites of predilection for the lodgment of foreign bodies are in the tonsil, the posterior surface of the tongue at its base, the piriform sinuses and the esophagus at the level of the sternal notch.

SPECIFIC INFECTIONS OF THE PHARYNX AND LARYNX

Two interesting cases within this group will be described to illustrate the importance of roentgen examination of the neck.

CASE 1.—A man, aged 35, entered with a clinical diagnosis of retrotracheal abscess secondary to a streptococcic laryngitis, after having been confined in a contagious disease hospital to which he had been committed with a diagnosis of laryngeal diphtheria. A plate was taken with a portable roentgen apparatus, merely with the idea of adding this case to the present series (fig. 4). The opinion was offered that no retrotracheal widening was present, but that there was marked edema of the arytenoids, particularly the right. The surgical opinion was that there was retrotracheal suppuration. Unfortunately the patient had been operated on before the roentgenologist's opinion reached the surgeon. Neither pus nor infiltration was found in the retrotracheal space, and a tracheotomy was subsequently done because of a marked streptococcus infection of the larynx and especially of the right arytenoid.

CASE 2.—A man, aged 27, ten weeks before admission had suffered from an acute tonsillitis which was followed in three days by an increasing inspiratory dyspnea. An emergency tracheotomy was performed at this time because of the obstructive dyspnea. The tracheotomy tube had been inserted through the left ala of the thyroid cartilage. Two weeks later the tube was removed, at which time breathing was apparently free. Breathing subsequently, however, became progressively worse, until at the time of admission it was urgently necessary to perform a tracheotomy (fig. 5). Laryngeal examination at this time showed an irregular swollen area springing from the left lateral wall in the supraglottic region. It was thought to be due to a localized necrosis and tissue reaction causing obstruction. The tracheotomy tube was worn for three months and then removed, leaving a well functioning larynx.

It is impossible from the roentgen appearance alone to differentiate the type of infection described from a diphtheritic infection.

Fig. 5.—A patient with streptococcic laryngitis. Obliteration of the laryngeal cavity necessitated a tracheotomy. The arrow points to the defect in the cartilage, the result of previous tracheotomy.

Fig. 6.—A patient with proved tuberculosis involving the vocal cords and aryteno-epiglottic ligaments.

In tuberculosis there is marked haziness of the outlines of the laryngeal cartilages, with thickening of the various structures including the epiglottis. There is rather marked narrowing of the laryngeal cavity (fig. 6). Unfortunately, our material has been limited in the case of syphilis of the larynx; in figure 7 is demonstrated the one case that we were able to observe in which the diagnosis was proved. Köhler stated that in this condition the contour of the larynx is apt to be sharply delineated. In late tertiary syphilis, Hay noted thickening and calcification of the thyroid and cricoid cartilage with an increase in density of the tissues and stenosis. Thost [7] described urate deposits in a "gouty" larynx.

TUMORS OF THE LARYNX

Carcinoma manifests itself by a replacement of the normal "boat" by a mass that may extend upward or downward into the trachea. Of particular importance is an infiltration in the retrolaryngeal structures, so that a thickening behind the cricoid can be noted which causes narrowing of the trachea. A complete discussion of this condition is offered by Pack and Craven [9] in a recent article. The progress of an advanced lesion after roentgen or radium therapy is particularly well studied by this method. Carcinomas of the upper part of the esophagus are demonstrated in the usual manner when, following the administration of barium sulphate, there is obstruction, constriction, irregularity of the margin and thickening of the periesophageal tissues.

Benign tumors of the larynx are often well made out. Hay showed illustrations of papillomas. The following is an unusual case:

CASE 3.—A girl, aged 3 years, entered with a history of hoarseness and difficulty in breathing since birth. She was seen by many pediatricians. The diagnoses offered were congenital laryngeal stridor, asthma and, in one instance, papilloma of the larynx. During the week before admission the dyspnea had become more intense, and during the last twenty-four hours the child was almost in asphyxia. On admission, air was entering the lungs every fourth inspiration. The chest appeared completely collapsed. Direct laryngoscopy showed an ovoid mass filling the larynx and part of the left piriform fossa. An immediate tracheotomy was performed. Three weeks later the tumor was removed under suspension laryngoscopy. It proved to be a cyst, filled with pus and attached to the entire extent of the left aryteno-epiglottic ligament. Recovery was uneventful (fig. 8).

TRAUMA

The traumatic cases usually show cicatricial stenoses of the trachea or esophagus. Operative defects in the cartilages can often be shown (fig. 5). Fractures of the hyoid bone, while uncommon, do occur, particularly with fractures of the mandible. It is necessary to use

9. Pack, G. I., and Craven, L. F.: Tumors of the Larynx and Thyroid, Arch. Otolaryng. **13**:658 (May) 1931.

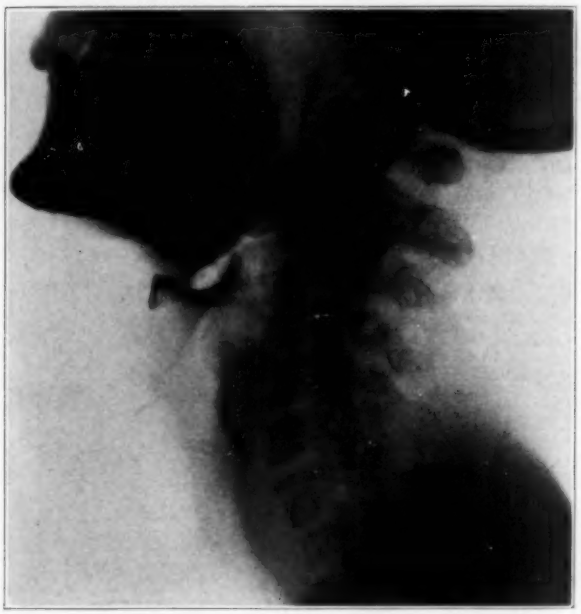

Fig. 7.—A patient with proved syphilis involving the vocal cords.

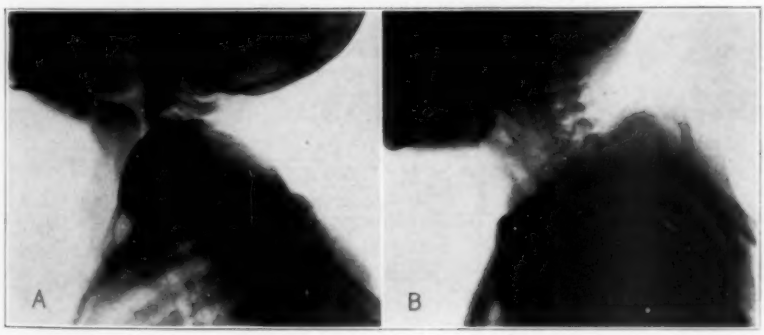

Fig. 8.—A patient with a cyst of the aryteno-epiglottic ligament before (*A*) and after (*B*) evacuation.

caution not to mistake the lines representing the approximation of the cornua for a fracture line.

Compressions of the trachea by external masses, such as goiter and carcinoma of the thyroid or thymus, will not be considered at this time. Calcified tuberculous nodes and salivary calculi will also be omitted. Attention is called to the common mistake of designating an unusually long styloid process or an irregularly calcified stylohyoid ligament as abnormal.

The following case was of unusual interest:

CASE 4.—A woman, aged 54, had had a progressively enlarging mass in the left side of the neck for a period of from eight to ten months. She had lost 35 pounds (15.8 Kg.) in this period, but complained of no other symptoms.

Fig. 9.—A patient with probable carotid body tumor.

Examination showed a soft swelling of the left side of the neck, protruding into the pharynx behind the posterior tonsillar pillar and externally under the angle of the left side of the lower jaw. It was about 2½ inches (6.3 cm.) in diameter, ovoid, elastic and not tender. There was a transmitted pulsation. A needle introduced into the pharyngeal bulge caused a spurt of bright red blood. The exact nature of the mass was not determined. It was considered inoperable and thought to be a carotid body tumor (fig. 9).

COMMENT

As in all other phases of medical and surgical practice, a roentgenographic examination of the involved part has been shown to be of considerable value as an aid to diagnosis. It must be used with a thorough appreciation of the limitations of roentgenography to do

more than outline shadows, and an understanding of the need for experience in viewing normal and pathologic variations. Roentgenograms show gross shadows of structures differentiated from one another because of their variations in opacity to x-rays, a physical differentiation that may have little relation to structural change, but fortunately usually does. Interpretation of these shadows, therefore, can be made only on the basis of experience in the correlation of such changes with the clinicopathologic changes that they represent. This demands complete cooperation between laryngologist and roentgenologist; both are essential to the proper interpretation of their own observations.

Roentgenography will be found of increasing value in the differential diagnosis of syphilis and tuberculosis, with the acquisition of greater experience. Examinations already demonstrate the extent of a malignant condition with considerable accuracy, and in some cases provide a valuable aid in differentiating between benign and malignant conditions. Its value in the localization and diagnosis of retropharyngeal abscess and foreign bodies is unquestioned. Roentgenography cannot replace any of the well established clinical procedures, just as it has not replaced physical examination in general clinical medicine, but in many conditions, it may simplify such procedures and confirm the findings in them. The plea is therefore made for more extensive use of the roentgen examination, with careful evaluation of the changes that are noted in it.

TUBERCULOMA OF THE LARYNGEAL VENTRICLE RESEMBLING PROLAPSE OF THE MUCOUS MEMBRANE

REPORT OF A CASE *

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SAN FRANCISCO

The ventricles of the larynx are two horizontal elliptic spaces situated on the inner aspect of the ala of the thyroid cartilage. They lie between the true vocal cord below and the so-called false vocal cord or ventricular band above (fig. 1).

Ventricular prolapse per se is a rare condition. It was first described by Lefferts in 1876. Since that time it has been a matter of controversy in the realm of laryngology. The great difference of opinion seems to be concerning the terminology and the etiology.

> By "prolapse of the ventricle," the term in general use, is to be understood the protrusion of a portion of the ventricular mucosa as a result of inflammatory edema or hyperplasia, so that the parts of the ventricle normally out of sight are carried inwards along with the swelling, and come to be brought in view of the laryngoscope.
>
> By the term "eversion of the ventricle" should be understood an inward displacement or invagination of the mucosa of the ventricle, so that it protrudes between the ventricular band and the vocal cord into the airway. This has not been observed apart from an inflammatory edema or thickening, or apart from the concurrent growth of a cyst or tumor.

The foregoing statement by Moore,[1] from the recent edition of Jackson and Coates, is probably as clear and concise a description of ventricular prolapse as is given in the literature.

True cases of the condition are extremely rare.[2] I believe it can be safely said that in a great percentage of cases what appears to be a prolapse of the laryngeal ventricle, on a closer and more careful investigation, proves to be inflammatory and usually tuberculous. From extensive clinical experience, both in general medicine and surgery, as well as in the specialty of otolaryngology, I have come to the conclusion that when such a condition appears to be present, it is almost pathognomonic of a tuberculous process.

When the anatomy of the larynx is recalled, with its great amount of soft tissue, the submucous connective tissue between the ventricular

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* Submitted for publication, Aug. 4, 1931.

1. Moore, Irwin, in Jackson and Coates: The Nose, Throat and Ear and Their Diseases, Philadelphia, W. B. Saunders Company, 1929, p. 907.
2. Moore, Irwin: J. Laryng. & Otol. **37**:265, 1922.

mucosa and the thyroid cartilage (fig. 2), it is rather surprising that more cases of ventricular prolapse do not present themselves. I am speaking, of course, in terms of comparison with other diseases of the larynx. Its relative rarity seems to be a good proof of the resistance that the soft parts of the larynx, particularly the areas beneath the cords and ventricle, have to local and systemic invasion.

Of the specific diseases of the larynx, tuberculosis is the most frequent. It is also one of the most important. On the discovery of a tuberculous lesion in the larynx, a diagnosis of pulmonary involvement

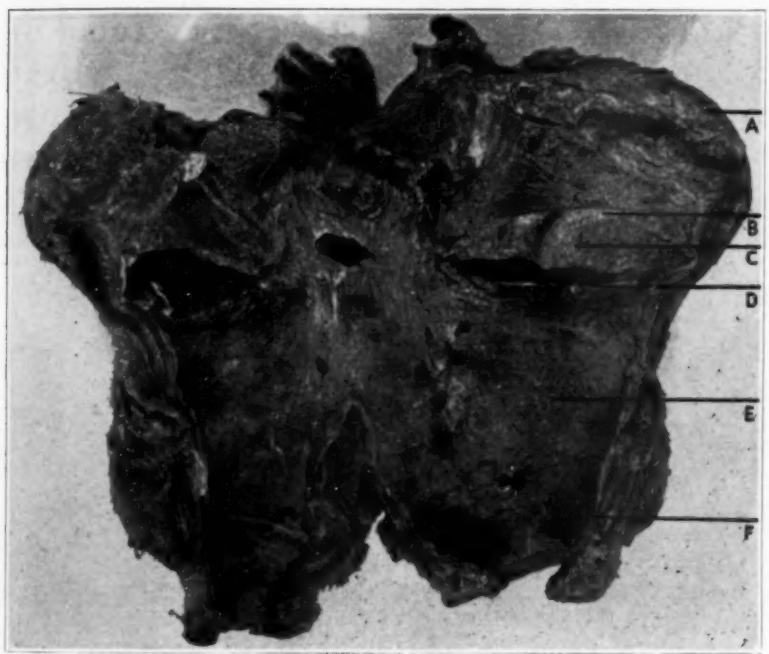

Fig. 1.—Anatomic dissection of a normal larynx. It shows at *A* the great wing of the thyroid ala; at *B*, the ventricular band or false vocal cord, and at *C*, mucous membrane of the left laryngeal ventricle. The photograph was taken at an angle so that it distorts the appearance of the ventricle somewhat. *D* indicates the true vocal cord; *E*, the inner aspect of the thyroid cartilage with its mucosa, and *F*, the inner aspect of the upper rings of the trachea with the mucosa covering them.

is at times verified. The importance of laryngeal tuberculosis in the prognosis of systemic tuberculosis is obvious.[3] The incidence of laryngeal tuberculosis in a great measure depends on the activity of the pulmonary disease. The more active and extensive the lesion in the chest, the greater the possibility of tuberculous involvement of

3. McKenzie, Dan: Diseases of the Throat, Nose and Ear, St. Louis, C. V. Mosby Company, 1928, vol. 2, p. 131. Thomson, St. Clair: Tuberculosis of the Larynx, Privy Council Medical Research Council, Special Series, 1924, no. 83.

the larynx. Thomson [4] made the statement that, from his observations, the prevalence of laryngeal tuberculosis is diminishing. The cause for this is hard to explain. I feel that with the years of crusade against tuberculosis the number of cases of advanced disease has been greatly lessened. This seems to be the opinion of directors of tuberculosis sanatoriums, and it seems probable when one realizes that the great percentage of cases of laryngeal tuberculosis develop in the group of patients with far advanced pulmonary lesions.

It is the prevalent opinion that laryngeal tuberculosis results from the arrest of germ-laden sputum in certain definite areas of the larynx.

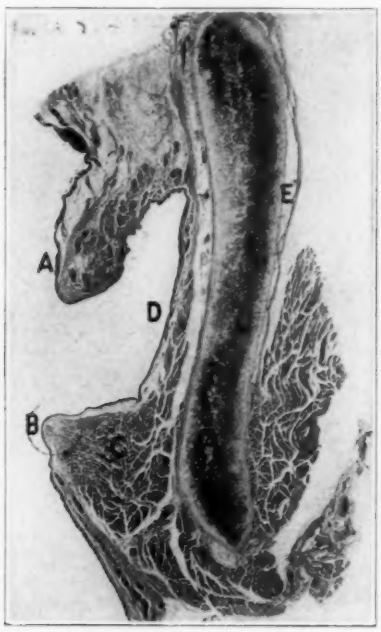

Fig. 2.—Photomicrograph showing the frontal section of the left half of a normal larynx. *A* indicates the false vocal cord and *B*, the true vocal cord, with muscular structure at *C*. At *D* is shown the tissue of the laryngeal ventricle, and at *E* a section of the thyroid cartilage.

These areas are the posterior third of the larynx, chiefly in the arytenoid and interarytenoid regions (fig. 3). The posterior third of the true vocal cord is also an area of predilection. In this manner the submucous tissues are ultimately involved. Another school favors the theory of systemic invasion by way of the lymphatics and the circulation. Both theories have their advocates; both have excellent proof. In the final analysis, both are probably correct in that laryngeal tuberculosis may develop by either of the two routes mentioned.

4. Thomson (footnote 3, second reference).

Briefly, the pathology of laryngeal tuberculosis is the pathology of the tubercle. True, it may manifest itself in various ways. Pathologic descriptions of the appearance and course of the disease are numerous.[5] Probably the most complete and scientific classification is that of Spencer.[6] His experience has been extensive and varied in both the treatment and the diagnosis of this disease. A simple description of infiltration, ulceration and perichondritis will suffice for this article. Seldom does any one of these pathologic processes remain as a definite entity. They usually merge into one another. Just as in tuberculosis in other portions of the body, the cases of most favorable prognosis are those that remain in the stage of infiltration with the least amount of

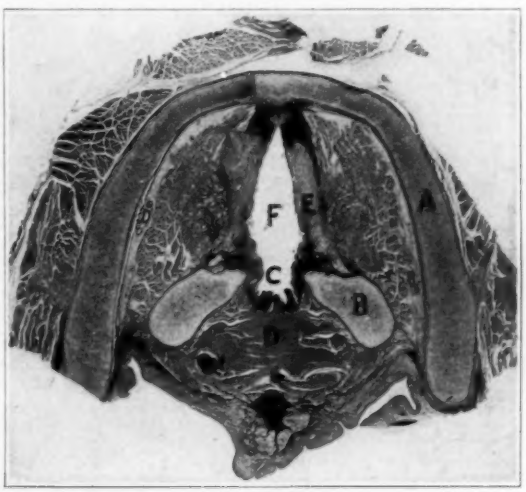

Fig. 3.—Photomicrograph of a cross-section of the larynx. It shows at *A* the thyroid cartilage; at *B*, the arytenoid cartilage; at *C*, the interarytenoid area; at *D*, the arytenoid muscle; at *E*, the vocal cord, and at *F*, the chink. It is at *B*, *C* and the posterior portion of *E* that tuberculosis of the larynx is prone to occur in its incipiency.

ulceration. The greater the amount of fibrositis, the better is the prognosis.

The usual clinicopathologic case of laryngeal tuberculosis is one of infiltration of the arytenoid area. Certain authorities of vast experience have individual methods of describing early laryngeal invasion. It is usually accompanied by a mild hyperemia or congestion of the posterior portion of the true cords. Symptoms are commonly absent in its incipiency.

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5. Patton, W. G.: Tumors of the Larynx, J. Missouri M. A. **27**:377 (Aug.) 1930.

6. Spencer, Frank R.: Laryngeal Tuberculosis, New York, J. B. Lippincott Company, 1927.

Wessely, of the Hajek clinic,[7] laid great stress on the appearance of the wine-colored mucosa of the interarytenoid area as an early diagnostic sign. Portmann, of Bordeaux,[8] described the early lesions as a daub of red paint on the arytenoids and posterior portions of the true cords. Others have characteristic methods of describing early lesions. It is early diagnosis that is of great importance if one expects to accomplish much in the ultimate treatment.

Soon a disturbance of the voice, a huskiness or hoarseness, and myasthenia manifest themselves clinically. Ultimately pain develops. Such occurrences in the presence of a tuberculous history are almost

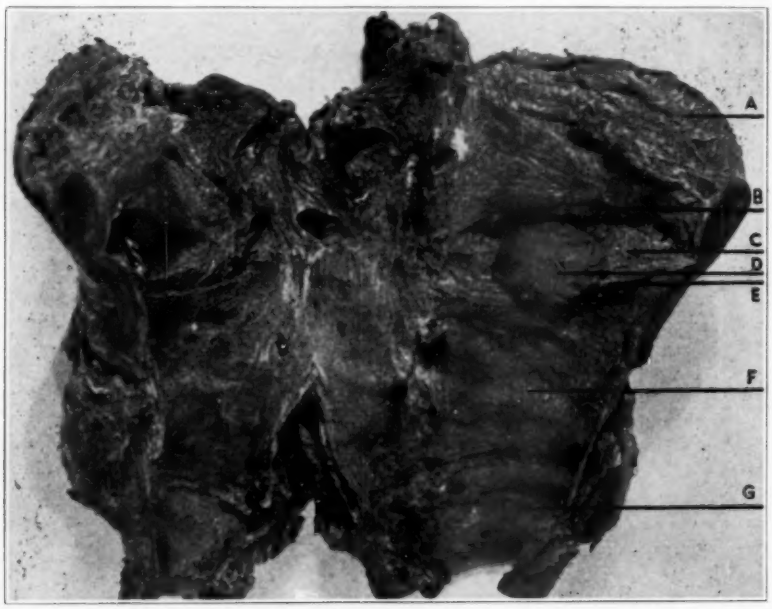

Fig. 4.—Anatomic dissection of a normal larynx, to which has been added a wax demonstration of the pathologic appearance of the larynx as reported. *A* indicates the great wing of the thyroid ala; *B*, the ventricular band; *C*, a portion of the mucous membrane of the laryngeal ventricle; *D*, a wax model of the appearance of a tuberculoma; *E*, a portion of the true vocal cord seen; *F*, the inner aspect of the lower portion of the thyroid cartilage with its mucous membrane, and *G*, the inner aspect of the upper rings of the trachea with its mucous membrane.

diagnostic. The concomitant occurrence of a malignant condition or syphilis, or both, must not be forgotten.[9] For all practical purposes, if

7. Wessely, E.: Personal communication.

8. Portmann, Georges: Personal communication.

9. Tucker, Gabriel: A Case of Chronic Hoarseness (Ulcerative Laryngitis) Showing Tuberculosis and Cancer in Same Lesion, J. A. M. A. **96**:1572 (May 9) 1931. Moore, Irwin: Intrinsic Cancer of the Larynx, London, University of London Press, 1921.

it is remembered that the occurrence of such lesions is comparatively rare, one will not commit the error of omission. They are pathologic curiosities, but even so their occasional existence must always be kept in mind.

A rare form of laryngeal invasion is that of tuberculoma.[10] It is described as a well rounded, smooth, pale tumor (fig. 4). It rarely ulcerates. With this many authorities have expressed disagreement (Patton [5]). Most observers are inclined to believe that the growth ultimately assumes the appearance of a typical laryngeal tuberculosis. The diagnosis is difficult to make without a biopsy and a study of the microscopic section (Patton [5]). I recently observed a case of tuberculoma of the larynx, which is reported because of its apparent rarity and its simulation of a prolapse of the laryngeal ventricle.

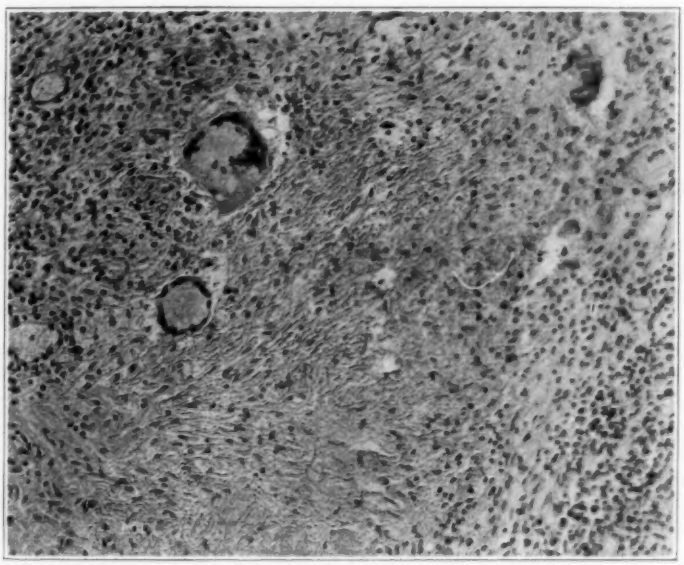

Fig. 5.—Photomicrograph of section showing giant cells, area of caseation, cellular infiltration and newly formed connective tissue.

REPORT OF CASE

Mr. F., aged 42, had an unimportant family history. The past history revealed tuberculosis, although for several years the case has been considered to be closed. For the three months previous to examination, the patient had been troubled with hoarseness, and the last two weeks with pain in the throat.

10. McKenzie (footnote 3, first reference). Watson-Williams, E.: Granuloma of the Larynx, Proc. Roy. Soc. Med. **23**:1531 (Sept.) 1930.

General examination by a reputable internist gave negative results as to hematologic, serologic and roentgenologic findings. The chest showed healed tuberculous lesions, as revealed by examination of the sputum and by x-rays. The pulse rate was 84, and the temperature normal.

The nose showed no anatomic deformities or pathologic changes. There was moderate dental sepsis. The tonsils were septic and embedded. The nasopharynx was normal. Indirect examination of the larynx showed a normal right vocal cord and arytenoids, which were freely movable. The left vocal cord could not be seen in a great portion of its extent, owing to a protrusion of the mucous membrane of the left laryngeal ventricle (fig. 4). This protrusion appeared to be tumorous, could be lifted upward so that the cord could be seen,[11] and could also be readily circumnavigated with a probe. It originated from the left laryngeal ventricle, and was smooth and not ulcerated.

The growth had the appearance of a laryngeal prolapse. Despite its appearance, I felt that, considering the history of the case and my past experience with a similar case, it was a tuberculous lesion, of the type of tuberculoma. To avoid error in diagnosis,[12] a piece of tissue was obtained under direct vision with a Jackson laryngoscope. Section showed tuberculosis (fig. 5). What was to be done with the patient? The internist who was in charge of the case was advised of the condition. The patient was given the usual general treatment for systemic tuberculosis. In addition, I blocked both superior laryngeal nerves to deaden the pain; this gave him a great deal of relief. The question of cauterization was considered. I refrained from this procedure for fear of the development of perichondritis. I believed that the patient's best chance was to be given systemic treatment, with local treatment for alleviation of pain and rest of the voice. All this was done.

Two months after operation, there was no improvement in the local pathologic condition. The pain was greatly alleviated, but the general condition remained the same as when the patient was first seen.

450 Sutter Street.

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11. Watson (footnote 10, second reference).
12. Spencer (footnote 6). Tucker (footnote 9, first reference).

THE HISTOPATHOLOGIC REACTIONS OF THE TRACHEOTOMIC WOUND

AN EXPERIMENTAL STUDY *

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The operation of tracheotomy dates back to the earliest times recorded in medical history. In the first century B. C., Asclepiades of Bithnia saved several lives by opening the trachea, the procedure being first known as bronchotomy. Aretius, however, later condemned the operation as tending to increase tracheal inflammation and because, as he said, the cartilaginous parts could not grow together again after their separation, a fact indicative of an interest even at this early date in the healing of the wound itself. Antyllus, in the second century B. C., called attention to tracheotomy in the treatment for cases of foreign body, and again there is evidence at this time of a curiosity as to the end-results of tracheotomy, for it is recorded that an Arabian physician, Ibn Zoar, divided the tracheal cartilages of a goat in order to prove that the cartilaginous wound could heal.

In the middle ages, Benevieni of Florence performed a tracheotomy on a patient with an abscess of the neck and cured him, while Fabricius of Aquapendente came so close to a description of the modern operation as to suggest the use of a short straight tube to be inserted into the tracheal wound and held in place with handles. The curved tube of today was first suggested by Casserius some time during the fifteenth century. Since the days of these pioneers, the operation of tracheotomy has occupied a more and more important place among the surgical procedures of modern times, and countless lives have been saved by means of it. To these names should be added especially those of Bretonneau and Trousseau who, with the recognition of the disease diphtheria, placed tracheotomy on a high level and by their success laid the foundation for our present concepts of the operation.

In the case of an operation the chief value of which lies in the efficient and spectacular saving of life, it is but natural that the major interest in it should concern the technic of its execution and the initial

* Submitted for publication, July 20, 1931.

* Presented as a candidate's thesis to the American Laryngological, Rhinological and Otological Society.

conditions that make the procedure necessary. The literature that deals with these aspects of tracheotomy is almost boundless. From time to time, however, there crop out of this mass of clinical data isolated accounts of studies of the tracheotomic wound itself, independent of the etiology of the obstructive factors that necessitated it. A little reflection will render the reason for this interest in the healing of the wound quite clear. The trachea forms a major part of one of the most important avenues of the body, the upper respiratory tract. Except for its most superficial portion, the larynx, it lies beneath protecting layers of skin and muscles, and its firm but elastic cartilaginous walls were intended by nature to resist almost any form of external trauma. Least of all did nature ever intend that an artificial opening should be made into it, for the purpose of either destroying life or saving it. Such an opening at once subjects the sensitive lining membrane to the irritation of unwarmed and unmoistened air, and gives rise to the complex problem, first, of how the defect is to be healed and, as a result of this healing process, of what residual changes or deformities may be left behind. When to these considerations is added the fact that in most instances a frankly foreign body is introduced into the wound in the form of a tracheotomy tube, it is quite apparent that a consideration of the histopathologic reaction of the tracheotomic wound affords ample opportunity for careful study.

The object of the present study was to throw some light on this question by means of experiments performed on animals. Such experimental work as has previously been done still leaves many debatable points unsettled, and in every instance fails to provide the graphic illustrations of the facts recorded, which are here afforded by photomicrographs. In order to provide the present work with a helpful and illuminating setting, it will be necessary to recount some of the known facts concerning the healing of such a wound as that made by a tracheotomy and to discuss the various aspects that enter into a consideration of how such healing may take place.

Offhand, one might be tempted to agree with Renault [1] in his naive statement as to the ease and simplicity with which the wound heals:

> When one considers the importance of the structures wounded by tracheotomy, the conditions under which it is practiced and the irritation of the wound by the cannula, one is astonished by the rapidity with which it heals itself. The tendency of the wound to unite is seen in the first dressings. If the wound remains but a few hours without the cannula, its reintroduction is already difficult. . . . The edges of the wound, which the cannula has changed into an almost circular canal, approximate and produce rosy granulations. If, at the end of eight days, these have been controlled and do not form a central button, the surface becomes covered with a brownish crust which later falls off, baring the healed wound.

1. Renault, Paul L. D.: Manuel de trachéotomie, Paris, G. Steinheil, 1887.

Unfortunately the process is not always so simple. The entire question of the possible formation of granulation tissue on the inner side of the trachea or of the formation of a constricting stenosis at the site of the wound is one about which information is desirable from a histopathologic point of view. What tends to give rise to these untoward sequelae and how they may be prevented are questions on which we have sought enlightenment in the present paper.

The basic principle in this matter is to be found in an examination of what takes place in a simple division of a cartilaginous ring, uncomplicated by the presence and irritation of a tube. The most complete work on this subject to be found in the literature is by Schueller,[2] who conducted some experiments on guinea-pigs. He opened the trachea by an incision running obliquely from above downward to form an inverted V or tongue-shaped flap. The animals were then left to themselves, no cannula was put in, and the wound was not sewn up. After a few weeks it was difficult to find the scar again, the tongue flap being healed in directly with the smooth scar. On transverse and longitudinal sections, no change was seen in the cartilage at the point of incision, except that the corners of the cut borders were rounded off a little. Between the divided pieces of cartilage there pushed in a more or less thick connective tissue which lay close to the cut edges of the cartilage and stood in direct connection with the perichondrium and the connective tissue adjacent to the latter. The cartilage cells showed little or no change weeks afterward except that at the cut corners they appeared somewhat compressed and arranged in several rows. Certainly no actual union or soldering together of the cut cartilage ends was seen. Nevertheless, some authors, notably Reitz,[3] have claimed that the intervening connective tissue, proceeding from the perichondrium and cementing the cut cartilage surfaces, gradually transforms itself into hyaline cartilage. In fact, Reitz described a proliferation of cartilage cells with simultaneous softening of the ground matrix, the growing cartilage cells taking on long processes which pushed across the wound and united with others from the other side.

Aside from this debatable point, it is quite clear that such an uncomplicated tracheal wound heals without special complication. No sooner, however, is the tracheal cannula introduced than the process at once becomes more involved and other factors are introduced, depending on the amount of infection and the length of sojourn of the tube. Schueller studied this aspect in dogs on which he performed a trache-

2. Schueller, Max: Die Tracheotomie, Laryngotomie und Extirpation des Kehlkopfes, Stuttgart, 1880.

3. Reitz: Sitzungsb. d. k. Akad. d. Wissensch. Math.-naturw. Cl., Wien, vol. 101, p. 501.

otomy, leaving a cannula in place for from twenty-four to forty-eight hours. The ensuing histologic changes were dependent on the course of the healing of the wound. The perichondrium was the most essential source of the inflammatory tissue, which presented itself in the beginning as a new formation of granulation tissue and in other places appeared in the form of young cartilaginous tissue, but between the separated cartilage ends consisted of connective scar tissue. The connective tissue and the granulations arose from the perichondrium. The cartilage itself, however, after forty-eight hours, showed an outpouring of its intercellular substance, and after five days one could determine an irregular resorption of the cartilaginous substance by the granulation tissue adjacent to it. This was, however, very gradual, and finally there was formed a firm connective tissue scar between the somewhat rounded-off cut ends of the cartilage. This process corresponds completely to what can be observed in human beings with tracheotomies except that in them pathologic changes are added by the original illnesses and the cannulas are retained, not for forty-eight hours only, but often for years. If one considers this process in the cartilage and perichondrium, the outpouring and resorption of the cartilage substance, and the final loss of cartilage through granulation formation and the later connective tissue scar formation, all the changes that we observe in any given case become clear.

What is not satisfactorily covered in these experiments, however, is the question of how great a degree of obstruction is produced in the final healing of the wound. Granted that the cartilage heals either by scar tissue or more directly, how much constriction of the tracheal lumen is produced, and what changes, if any, take place in the mucous membrane?

It has long been known that stenosis of the trachea can and does develop at the site of the tracheotomic wound. This takes place by three different processes. First, there occurs a distortion of the tracheal wall in such a way that the pressure of the cannula depresses a part of the cartilage surrounding it, thereby producing a chronic deformity and obstruction. This situation arises far more often when the single longitudinal incision is used in preference to the crucial incision or the so-called punch tracheotomy, either of which allows the cannula greater freedom of location. If the incision is too small or the cannula too large, the cartilaginous deformity may result. In addition to the cartilaginous deformity, the mucosa is pushed out of place, thus further impairing the lumen. Moreover, the overlying soft parts may be dragged along with the cartilage, epithelialization taking place in this position and giving rise to a still more obstinate stenosis.

The second cause of stenosis secondary to the cannula is the formation of diffuse granulations. Soon after operation, there form between the edges of the cut surfaces and the tube, small granulation warts which try to fill the space between the two. Gradually the small areas combine to form a sort of granulation canal in which the cannula lies, pressure from the latter tending to increase them. Growth from the cut edges of the mucous membrane tends also to occlude the lumen in the fistula, and these edges began themselves to grow granulations. Not only on the surfaces of the wound but also deeper in the tissue, granulations tend to spring up, the starting point being, according to Thost,[4] the perichondrium. The granulation formation forces itself between cartilage and perichondrium, and grows into the cartilage itself, penetrating all the tissues in the region of the cannula. Since granulation tissue is composed chiefly of new-formed blood vessels, the latter advance in all directions and dissolve the cartilage, so that the original texture of tissue layers in the region of the fistula is completely changed. Cartilage, perichondrium and mucous membrane are absorbed into this granulation tissue, and after a short time the region about the cannula for several millimeters, sometimes even for a centimeter, is changed into a soft, elastic granulation tissue in which nothing is to be seen of the original tracheotomic wall.

The third cause of stenosis resulting from the presence of the cannula is the formation of scar tissue. If, when the cannula has been present for a considerable time, a stenosis develops, it is usually the cannula and its long sojourn that are responsible. The diffuse granulation tissue is the forerunner of scar tissue with a transitional stage of connective tissue. This scar tissue, which has a great inclination to contract and narrow the lumen, is pressed apart by the cannula, which prevents the closure of the fistula. If the cannula is removed, the tracheotomic canal closes rapidly by means of scar tissue. If the larynx is not yet patent, the cannula must be replaced and a vicious circle is initiated, since the cannula causes the formation of granulations and later of scar tissue, which in turn prevents the removal of the cannula.

From the foregoing account, taken largely from Thost, it may be seen that the prolonged wearing of a tracheal cannula is, in many instances, prone to lead to unpleasant if not serious sequelae, and that a tedious convalescence is apt to follow. That such has been the experience of many men is at once apparent when we examine the various suggestions that have been offered from time to time as to how one may dispense with the cannula altogether. Thus Martin,[5] in 1878,

4. Thost, Arthur: Die Veränderungen der oberen Luftwege nach dem Luftroehrenschnitt, und deren Behandlung, Wiesbaden, J. F. Bergmann, 1911.

5. Martin, Henry A.: Tracheotomy Without Tubes, Tr. A. M. A., Philadelphia, 1878.

described how he "stitched the edges of the trachea (three rings having been divided) and the skin together on each side with silver wire sutures and attached each stitch to a piece of old elastic garter of the patient's mother, carried around back of the neck." Similarly, Packard,[6] in 1885, objected to the use of the tube on the ground that it took up too much room, injured the tracheal walls and blocked the expulsion of secretions. Admitting the immediate advantages of such a procedure, one wonders what the ultimate effect on the tracheal lumen would be if the overlying tissues were thus given an opportunity to fill in the defect, unhindered by the presence of a tube. Cohen,[7] in 1874, voiced these objections in urging against dispensing with the tube on the ground that the swelling of the soft parts is often so great as to prevent free access of air to the artificial opening. Moreover, the formation of granulations may take place so rapidly as to close the defect in the trachea before the favorable course of the disease has overcome the occlusion of the larynx. Whenever an artificial opening has to be maintained for more than a few days, the use of the cannula seems indispensable.

These facts lead naturally to the question put by Thost: "Is it possible to open the trachea and insert a cannula without separation and distortion of the cartilaginous walls," and hence avoid a tendency to stenosis? His answer in the affirmative is based on two principles: 1. The cut must be so placed that there is room for the cannula without displacement of the cartilages. 2. The size and form of the cannula must be such that displacement of the cartilages does not take place.

Obvious as the method of attaining the first of these desiderata seems today, the suggestion, fathered by Dieffenbach, that an actual segment of cartilage be removed to allow ample space for the cannula was regarded as the height of heresy. He argued wisely that since the portion of trachea adjacent to the tube is certain to become infected and to be in part replaced by scar tissue, initial excision is quite justifiable.

The fact that in the average case with a single linear incision healing appears to occur satisfactorily does not exclude the risk even of mild tracheal stenosis, and the possibility that a severe stenosis may develop is reason enough for trying to avoid it.

In England, Marshall Hall first suggested the use of punch forceps in excising a window of tracheal cartilage without the insertion of a cannula. Bardeleben, in 1872, mentioned this procedure, but feared lest the swelling of the soft parts and rapidly inriding granulations would soon obstruct the air ingress. On the other hand, it is quite possible that in the absence of irritation from a cannula, there would be

6. Packard, John H.: Suggestions as to Substitutes for the Tracheotomy Tube, Tr. M. Soc. Pennsylvania, 1885.

7. Cohen: Tr. M. Soc. Pennsylvania, 1874.

very little tendency to formation of granulations. There is something to be argued for each procedure.

Among the suggestions of various authors as to the ideal method of handling the problem, nothing is said of the so-called crucial incision, which offers a considerable space for the tube and still preserves the maximum amount of cartilage for subsequent restoration of the anterior tracheal wall.

Confronted with these variations in opinions, first, as to the exact healing processes of the tracheotomic wound, and, second, as to the various advantages of using a tube or leaving the wound open, and particularly as we were unable to find any study of the type here undertaken, we have performed a series of experiments on cats and prepared microscopic sections of the tissue under varying conditions. Photomicrographs have been made from the most representative of these sections, which afford a graphic illustration of what takes place in the tracheotomic wound under differing types of incision and after varying intervals of time.

EXPERIMENTAL WORK

The series of experiments was carried out in a surgical laboratory, adult cats anesthetized with ether being used. Adequate surgical asepsis was maintained during operation and as far as possible afterward, in consideration of the activity of the cats. Various difficulties were encountered from time to time, which will be dealt with in connection with the individual experiments.

We sought primarily to throw some light on three questions: first, the process of healing of the cartilaginous defect; second, the tendency to the formation of granulation tissue as a result of the presence of the tube and the production of any obstruction of the tracheal lumen, and third, the tendency for the overlying tissues to fill in the cartilaginous defect and hence produce stenosis in the absence of the tube.

Figure 1 *A* shows the preparation of the wound with the trachea exposed, preparatory to performing experiment 1, figure 1 *B* the crucial incision made in the trachea and figure 1 *C* the method of closing the muscles over such a tracheal wound.

EXPERIMENT 1.—The skin of the neck was shaved and washed with soap and water, and then with alcohol and corrosive mercurous chloride. A midline incision was made through the skin and subcutaneous tissue, exposing the underlying muscles. These were readily separated by blunt dissection to expose the underlying trachea from the level of the cricoid cartilage down to the fourth to sixth rings. The incision into the trachea was then made transversely through one ring and then longitudinally through two rings, thus making a simple crucial incision. The muscle layer was then approximated with interrupted silk sutures, as were also the subcutaneous layers and skin. The skin was then painted with tincture of iodine, and the cat was returned to its cage.

The postoperative course was uneventful, the wound healing by first intention. The animal was killed on the thirteenth postoperative day.

Figure 2 shows the gross specimen removed. At the site of the crucial incision, viewed from inside the tracheal anterior wall, can be seen a slight dimpling, and just above it a tiny mass of granulations, appearing as a small black spot in the photograph.

Microscopic sections were next cut from the region of this healed crucial incision and slides prepared from them. It was first necessary, however, to have a

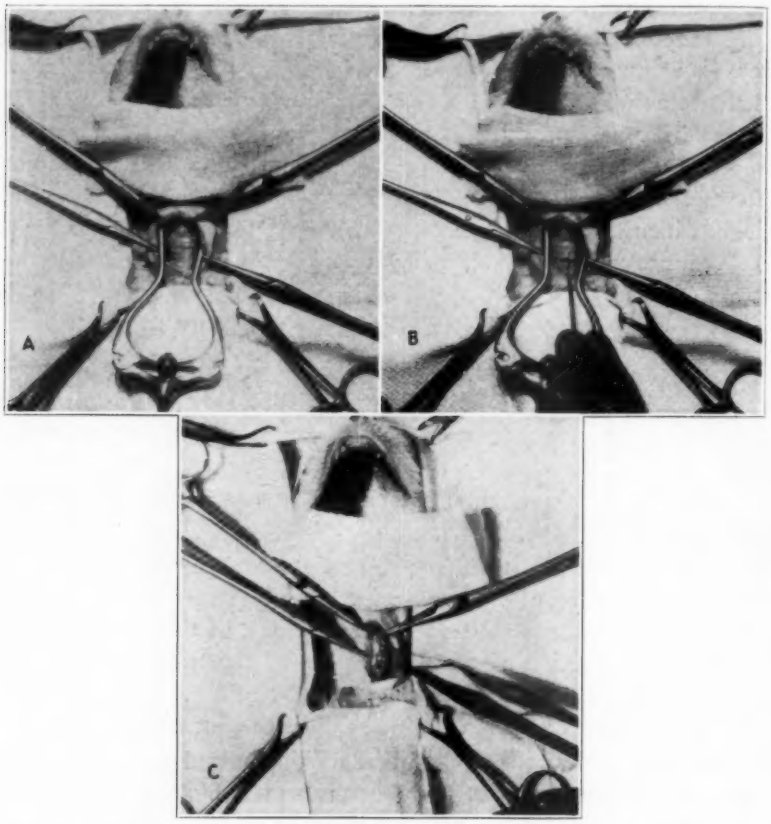

Fig. 1 (experiment 1).—*A*, general field of operation, showing exposure of the trachea preparatory to incision. *B*, the method of performing the crucial incision in the trachea. Notice the tendency for the cut edges of the cartilage to gape and spring apart. *C*, the muscle layers closed with interrupted black silk sutures over the crucial incision in the trachea.

standard of comparison in a preparation of a normal tracheal wall. This was made by excising a segment of normal trachea and preparing sections from it. A description of its histologic appearance, as shown in figure 3, is as follows:

Three sections showed the normal trachea of a cat. The layers were well differentiated into mucosa, submucosa and cartilaginous portions. The mucosa was lined by pseudostratified high columnar ciliated epithelium. The epithelium

cells rested on basal bodies. The submucosa was composed of a loose connective tissue, in which lay numerous glands, both mucous and serous in type, and many small capillaries. Beneath the submucosa could be found the tracheal cartilage, encased in perichondrium. The cartilage cells were numerous and well formed, lying in normal appearing lacunae. The posterior half of the cartilage ring was separated at its midpoint, the ends being connected by loose connective tissue.

The microscopic appearance of the specimen shown in figure 2 was as follows (fig. 4):

Section I: This consisted of twelve sections from the same block, taken from a cat into whose trachea a simple crucial incision had been made thirteen days previously. The sections include the entire tracheal ring and the connective and muscular tissue beneath the skin over the anterior surface of the tracheal ring. The site of the incision was easily recognized. The mucosal surface, lined by columnar ciliated epithelium, was everywhere normal and intact, except at the site of the incision. Here the mucosa was drawn in toward the submucosa and was thrown into several small, smoothly curved folds. The character of the

Fig. 2 (experiment 1).—Gross specimen: view of anterior tracheal wall from within.

epithelium was altered over this area, the normal columnar form being replaced by regenerated epithelium of a flatter type. Ciliae were absent here, but this may be accounted for by trauma since the ciliae were in places found stripped from the mucosa. The epithelium had fully regenerated. The glands in the submucosa, both serous and mucous, showed no change. The capillaries which were scattered numerously throughout the submucosa, showed moderate to marked congestion, particularly near the borders of the incision. The tracheal cartilage was composed of a large number of lacunae containing normal appearing cartilage cells lying in a dense basic-stained cartilage matrix, which showed nothing unusual. The posterior half of the ring was essentially normal. The line of incision went through approximately the midportion of the anterior half of the tracheal ring. The cut surfaces of the two separated sections of cartilage were represented by straight lines with rounded ends, around which the perichondrium had grown. There was no evidence of regeneration of cartilage at the line of incision. The gap was entirely filled by large numbers of young fibroblasts accompanied by newly formed capillaries. A small amount of collagen deposit was noted. This fibrous tissue

ingrowth completely filled the gap caused by the incision and extended up into the submucosa to the mucosal layer. The cut ends of the cartilage did not lie parallel to one another, the proximal layer being pulled away from the mucosal side toward the muscle by the trauma accompanying the incision, forming thus an acute angle with the distal cartilage cut surface. There was no evidence of narrowing of the lumen of the trachea by this incision. The lumen appeared to be wider than normal, particularly at the point of incision.

Figure 5 shows the type of wound made in experiment 2. A crucial incision was followed by removal of the four corners, leaving a circular

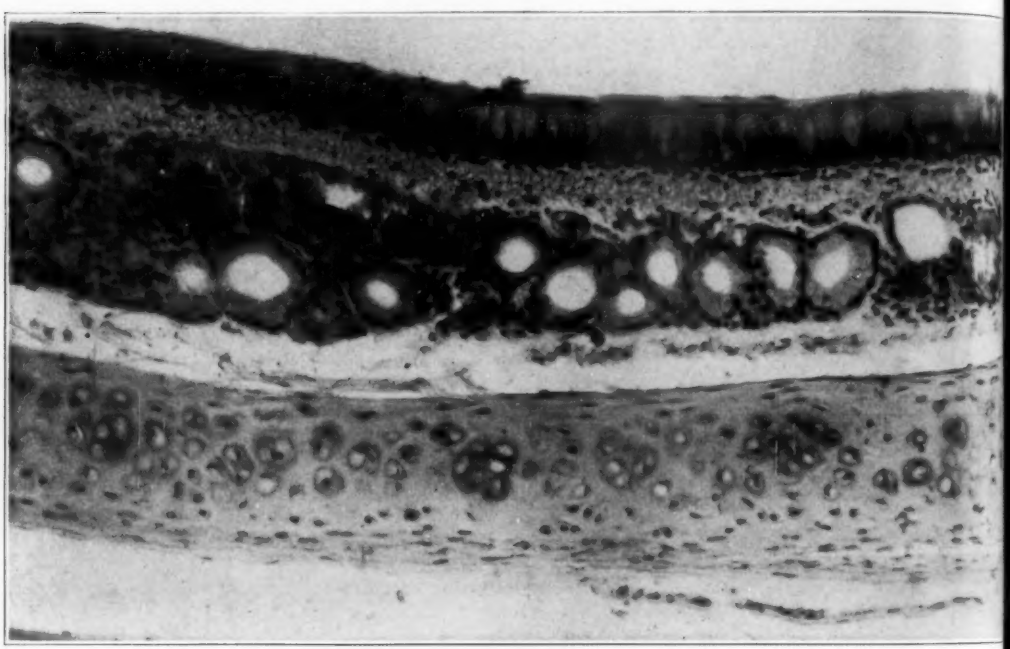

Fig. 3.—Normal trachea (high power).

opening slightly larger than the diameter of the tracheal tube (fig. 6). The wound was closed in exactly the same manner as shown in figure 1 *C*.

EXPERIMENT 2.—The trachea was exposed in the customary way through a longitudinal incision. A crucial incision was then made in the wall of the trachea, the transverse incision extending the full diameter of the trachea, and the longitudinal a distance to include two rings. The corners of the flaps thus made were then cut away with a small rongeur, making a round defect in the wall of the trachea.

The muscles and also the subcutaneous layer and skin were then approximated with interrupted A silk ligatures. The animal withstood the procedure well.

On the first and second days postoperatively there was a definite emphysema in the region of the wound. This was much decreased on the third day and there-

after could not be detected. The wound healed readily by first intention. The animal was killed with ether on the thirteenth postoperative day.

The gross specimen of the trachea removed from this animal is shown in figure 7. It will be noted that in the case of a circular window made in the tracheal

Fig. 4 (experiment 1).—Healed wound of trachea after crucial incision.

wall, the depression resulting in the mucosal surface is more extensive and there is a larger nodule of granulation tissue than in the case of a simple crucial incision.

The microscopic appearance of this specimen (fig. 7) was as follows (fig. 8):

Section II: This consisted of nine sections from the same block. A simple crucial incision had been made into the trachea, with removal of the corners; the

wound was thirteen days old. The general topography was similar to that of section I, except that the posterior portion of the tracheal ring was missing. The nine sections showed various pictures of the process. The gap was easily identified, being in some sections much wider than in the first case. In all the sections, the gap was entirely filled and the epithelium intact. The epithelium again showed the transition from the high columnar type to a flattened and thinned layer. At the center point of the incision the mucosa was sharply drawn in toward the submucosa in the shape of an inverted V. The descending distal link of the inverted V showed a slight return to the higher type of epithelium. There had been complete regeneration of the epithelial surface, and the ciliae were present and unaltered. The submucosa showed very little alteration in the size and distribution of the glands, except in the area of the incision where the glands had been replaced by abundant

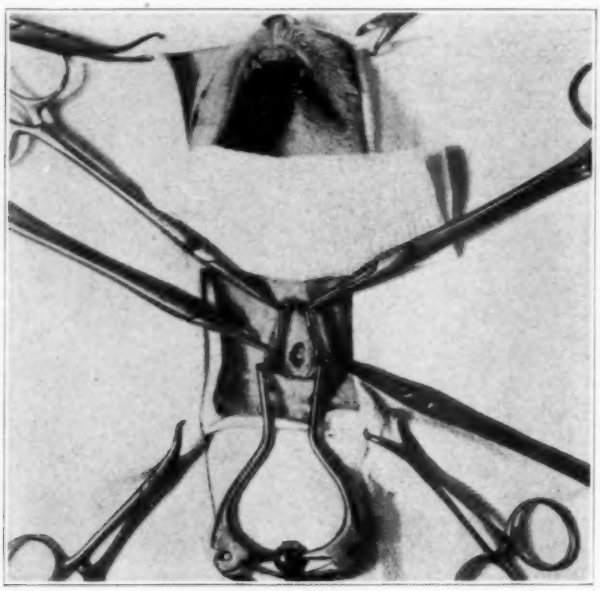

Fig. 5 (experiment 2).—Crucial incision in trachea with corners removed.

growth of young fibroblasts, which were proliferating in an orderly manner. The fibrous tissue ingrowth reached to the mucosa in one direction, flared off for a short distance to the right and left in the submucosa, and then could be traced between the cut ends of the cartilage up between muscle bundles and the loose connective tissues above the cartilage. In one section (6) of this series a slightly different picture was seen. Here the gap was closed by fibroblastic ingrowth, as in the other sections, but the two ends of the incised cartilage almost touched at one point, the zone of fibroblastic proliferation narrowing markedly and then widening again about this area. The distal cartilage section showed normal appearing cartilage cells and matrix, and was bridged to the gap and to the proximal cartilage section by an area of pale fibrocartilage in which a small number of cartilage cells were present. As this fibrocartilage reached almost to the proximal section, it flared off toward the muscle layers away from the mucosa, thus forming an acute angle with the proximal section of cartilage. The perichondrium over the

distal portion had been lifted and displaced for a short distance during the operative procedure, thus accounting for the small amount of cartilage regeneration described. No true hyaline cartilage could be found. There was no evidence of narrowing of the tracheal lumen except in one section (4) in which a transition to the epidermoid type of epithelium was noted. This, however, was not noted in the other sections.

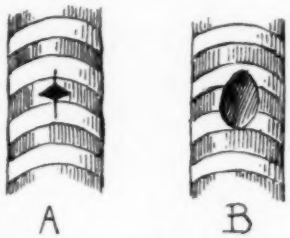

Fig. 6.—*A*, crucial incision; *B*, round defect after cutting away flaps with rongeur.

Fig. 7 (experiment 2).—Gross specimen: view of anterior tracheal wall.

In experiment 3 the same crucial incision was made as in experiment 1, but the inner cannula of a no. 1 tracheotomy tube was inserted. The appearance of the tube as it lay in place is shown in figure 9.

EXPERIMENT 3.—The trachea was exposed in the routine way through a midline longitudinal incision. A crucial incision was then made, the transverse incision extending the diameter of the trachea; the longitudinal, the distance of two rings. A tracheotomy cannula was then inserted through this opening into the lumen of the trachea. The cuff of the cannula was sutured to the skin, which was approximated with interrupted A silk, no attempt being made to approximate the underlying layers. The line of incision was then covered with collodion.

The animal's postoperative course was disconcerting and discouraging. The tube crusted, closed and could not be kept open. There was a complete refusal on the animal's part to take food. The wound became grossly infected, pus exuded from about the cannula, and finally, on the sixth postoperative day, the silk sutures

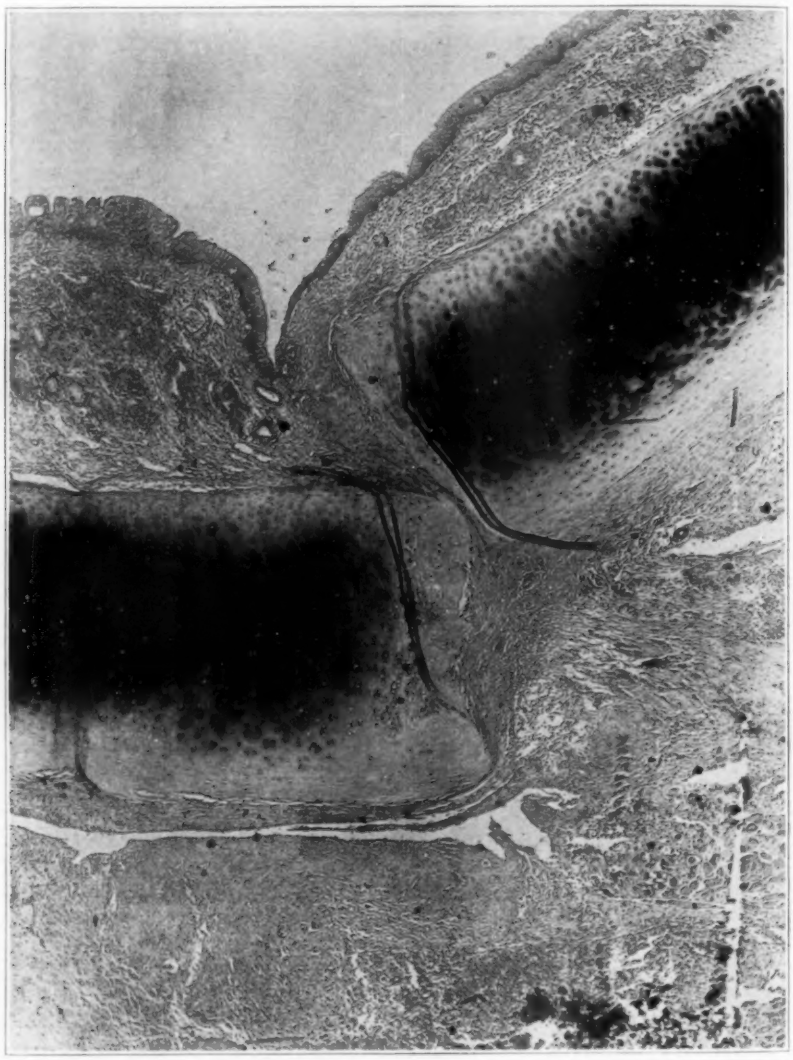

Fig. 8 (experiment 2).—Healed wound of the tracheal wall following a circular opening.

holding the cannula in place cut through the skin and the cannula came out. The wound, although infected, closed rapidly, filling in with granulations. On the ninth day, the animal was killed with ether. Autopsy showed no gross evidence of pneumonia.

From this description it will appear that the tube was not well tolerated. Further study of the situation led us to the conclusion that the tube used was not suited to the cat's trachea. For this reason we devised a shorter and less curving tube. Views showing the differences in the two tubes are seen in figure 10.

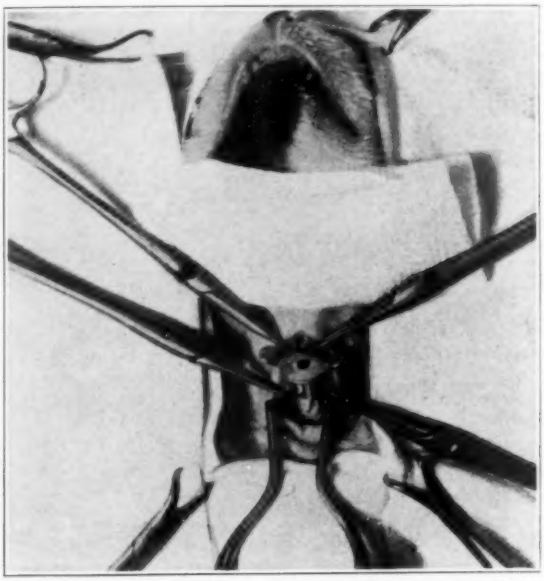

Fig. 9.—The tracheal cannula introduced into the crucial incision.

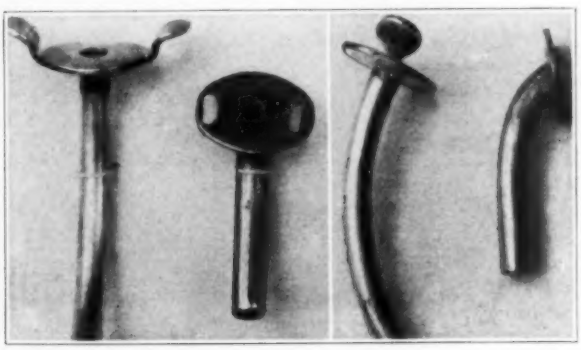

Fig. 10.—Anteroposterior and lateral views of the two types of tracheal tube used, the modified tube to the right.

Figure 11, showing the gross specimen from experiment 3, indicates how complete was the tendency for the tracheal wound to close, in spite of a week's sojourn of the tube and the infection resulting therefrom. The absence of visible granulations is still more noteworthy.

The microscopic sections made from this wound appeared as follows (fig. 12):

Section III: Five sections were made. The general topography was similar to that of the preceding sections. The most striking change was seen in the mucosal layer, in the area over the line of incision. Here there was seen a transition in the character of the epithelium, a metaplasia of the normal columnar ciliated type to a heavy squamous type of epithelium. In several of the sections a tiny, barely perceptible break in the continuity of the epithelium was noted, marking the point of final closure of the incision and regeneration of the epithelium. This was located, in every instance, at approximately the midpoint of the line of incision. The submucosa for a short distance on either side of the incision was replaced by connective tissue. There was no regeneration of the mucous glands. Strewn through the loose tissues above and below the cartilage rings were numerous dilated lymphatics and congested capillaries. The cut ends of the cartilage rings

Fig. 11.—Gross specimen from animal in experiment 3.

overlapped in several sections, due probably to the trauma occasioned by the insertion of the tube. The ends were at no time in apposition. In one section (5) the cut ends showed no overlapping and the rings lay in a straight line some distance apart. The gap, as in the previous sections, was filled by connective tissue proliferation, and in addition, a large number of polymorphonuclear cells were scattered throughout this area, piling up in fairly large numbers near the cut ends of the cartilage. In the center of this filled-in gap could be seen a small area of newly formed fibrocartilage, in which a few cartilage cells could be identified. A strip of perichondrium could be traced from this to the distal cartilage section through the mass of fibroblasts and acute inflammatory cells. Otherwise there was no evidence of regeneration of the cartilage or of narrowing of the tracheal lumen.

Experiment 4 was performed with a view to seeing if, by using a more robust animal and the shorter form of tube, the cannula could not be tolerated for a long period of time. Otherwise the procedure was essentially the same as that in experiment 3.

EXPERIMENT 4.—The trachea was exposed through a midline longitudinal incision and a crucial incision made in the trachea at the level of the third and fourth rings below the cricoid cartilage. A modified tracheotomy tube was then

Fig. 12 (experiment 3).—Healed wound following crucial incision and insertion of a tube after nine days.

inserted through this opening. The skin only was approximated, with untwisted silk, and the collar of the cannula was sutured to the skin.

The cat was robust, but during the first three or four days following operation it refused to eat or drink, lost weight, drained pus from the wound and became almost cachectic in appearance. The airway became clogged repeatedly. On the eighth

day no air passageway could be obtained after cleaning the tube in the usual way, owing perhaps to the tube having slipped out of the trachea. The surrounding tissue became markedly indurated, but did not break down.

On the fourteenth day the animal was killed by ether; the tube was found protruding sidewise against the margin of the tracheal wound.

The microscopic appearance of the wound was as follows (fig. 13):

Section IV: Nine sections were made. The picture in general was similar to that of previous sections. The gap was completely filled and the epithelium was

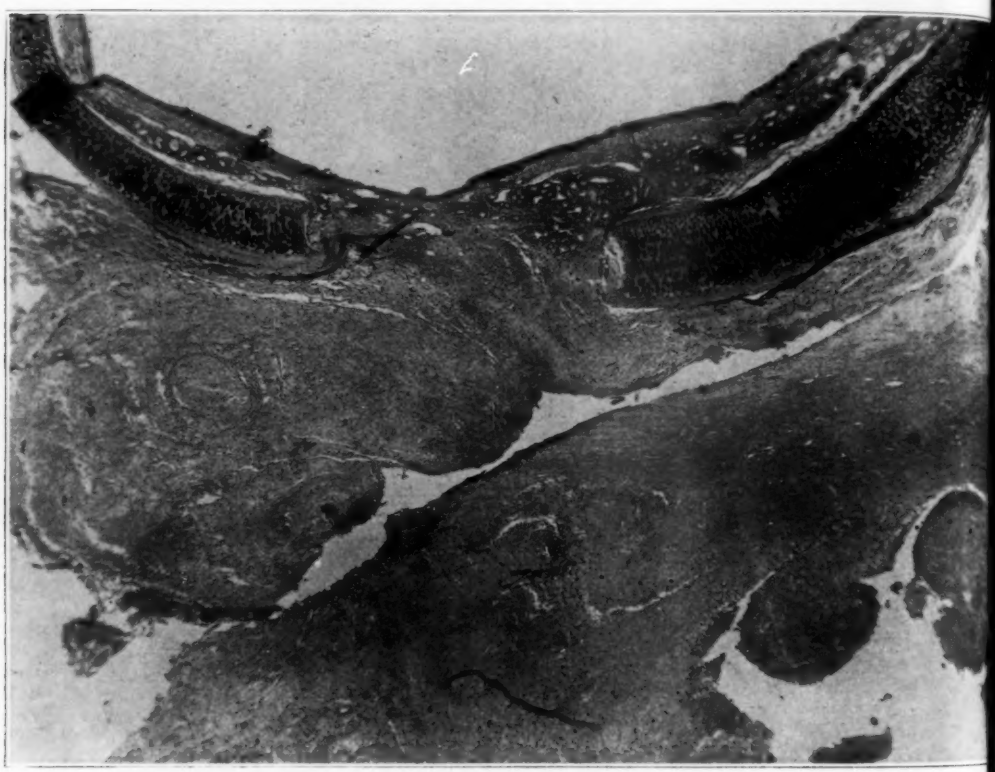

Fig. 13 (experiment 4).—Healing of tracheal wound after crucial incision and insertion of the modified tube.

intact and normal except for marked flattening over the area of the incision. The gap was filled by loose connective tissue with abundant collagen fibrils. A marked acute inflammatory reaction was present, and spread with the connective tissue beneath the muscle layer, where a large abscess was found, consisting mainly of necrotic tissue and large numbers of polymorphonuclear leukocytes. The cut ends of the cartilage were well separated by this ingrowth of connective tissue. The extreme ends of both sections of cartilage showed atrophic changes, but these were not widespread. The submucosa was very vascular, and marked capillary congestion was present. There was no evidence of narrowing of the tracheal lumen.

This experiment indicated to us that something more was necessary in order to retain the tracheotomy tube in place for the desired length of time. By one method or another, the cat was able to work the tube out of the opening, and hence allowed the tracheal wound to close prematurely. It was impractical to restrain the cats to the point of preventing them from manipulating the tube, no matter how securely it was sutured in place.

Fig. 14.—*A*, modified and plain tracheal tube, side view; *B*, front view.

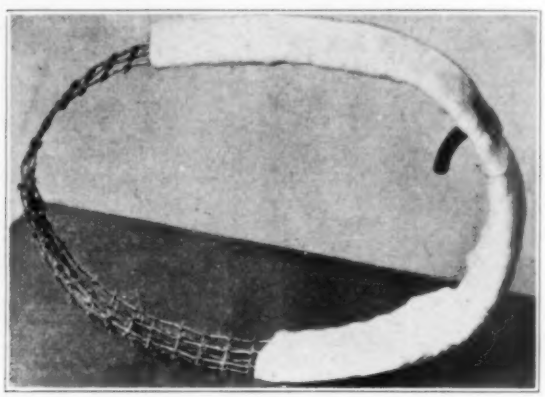

Fig. 15.—Wire collar and tube attached.

For this reason we devised the apparatus shown in figure 14. In figure 14 *A* is shown to the left a modified form of tube to which has been added a prolongation beyond the usual shield, shown on the right in the same figure. This prolongation is threaded, and on to the thread is screwed a round disk with a central perforation. This disk is shown in a front view in figure 14 *B*. In this figure the newer form of tube is to the left, and the older to the right.

In figure 15 is shown the method of employing this tube. A wire mesh collar was constructed, of the proper diameter to fit the cat's neck snugly when suitably wound with gauze bandage. The double disk tube was then attached in such a way that the fixed disk was on one side of

the wire gauze and the outer disk screwed on over the other side of the wire. This apparatus was fixed in place after the tracheal tube was inserted in the wound, and tended to hold the tube in place in spite of all the cat's efforts to dislodge it.

Using this apparatus, experiment 5 was carried out as follows:

EXPERIMENT 5.—The trachea was exposed by a midline, longitudinal incision; a simple crucial incision was then made in the trachea at the level of the third to fourth rings, below the cricoid cartilage. A tracheotomy tube was inserted into the opening, the wound was closed in layers with interrupted silk and the projecting portion of the tube secured to a gauze-covered wire mesh collar that extended

Fig. 16.—Gross specimen from animal in experiment 14.

around the animal's neck. Following the operation there was some coughing, but the tube remained in place and the airway was maintained.

The postoperative course was stormy: The animal would not eat, the tube became stopped up and breathing became labored. The wound remained in good condition. However, the course was one of a progressive downhill trend from the time of operation, and on the morning of the seventh postoperative day the cat was found dead in its cage.

Postmortem examination showed the tube to be well in place; there was a long abscess tract extending from the region of the wound down into the mediastinum. Grossly there was no evidence of pneumonia. The animal was markedly dehydrated.

The microscopic appearance of the tracheal wound was as follows:

Section V: Three sections were obtained. The line of incision was marked by scar tissue formation through the various layers from the submucosa between the cut ends of the cartilage through a path separating the muscle bundles. The mucosa and submucosa were heavily infiltrated by acute inflammatory cells. The epithelium covering the area of incision was flattened and in part destroyed, both by the trauma

of the tube insertion and the accompanying infection. Dilated lymphatics and congested and newly formed small blood vessels were numerous. The cut ends of cartilage were well separated by coarse, loose connective tissue, and pieces of perichondrium were lifted and displaced toward the line of incision. A small area of new-formed fibrocartilage extended from the displaced perichondrium of the distal section of the cartilage toward the mucosa and the proximal end of the cut cartilage. There was no evidence of narrowing of the tracheal lumen.

It is evident that in spite of careful aseptic technic there was a great tendency for these tracheal wounds to become infected. Experiment 8

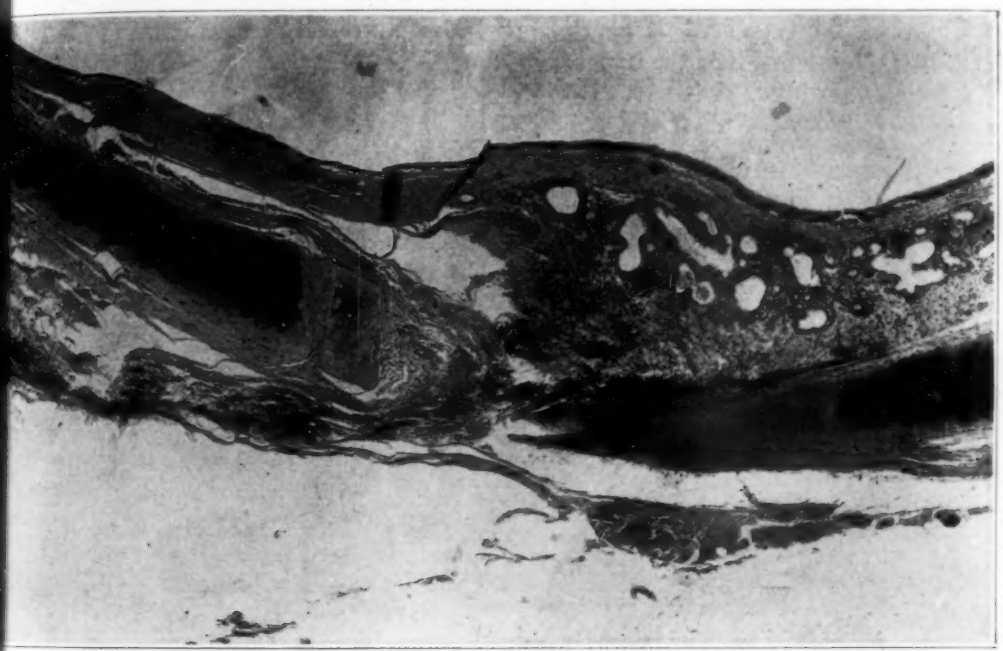

Fig. 17 (experiment 14).—Healing tracheal wound with a large cartilaginous defect covered anteriorly by soft tissues, without a tube.

(experiments 6 and 7 were unsatisfactory) was an attempt to see if this infection could be avoided.

EXPERIMENT 8.—The usual midline approach was used, and a simple crucial incision was made in the trachea at the level of the third and fourth rings below the cricoid cartilage. The curved tracheotomy tube was then inserted, the wound closed in layers and the protruding portion of the tube fixed to the gauze-covered wire mesh collar by means of a set screw on the tube.

The postoperative course was discouraging for the first four days, the animal refusing to take anything by mouth, but the tube was kept open with little difficulty. On the fifth day the animal began to drink, and a day or two later to take food. The external appearance of the wound was at all times good until the tenth day, when fluctuation could be made out beneath the collar in the region of the wound.

This was drained. The animal continued to lose weight, but was active until it was killed with ether on the fourteenth postoperative day.

Postmortem examination showed the tracheotomy tube well in place and a moderate degree of tracheitis but no gross pneumonia.

The microscopic appearance of the wound was as follows:

Section VIII: Fifteen sections were made. The general topography and features were similar to those of the previous sections. There was no evidence of regeneration of cartilage or of narrowing of the tracheal lumen. An inflammatory sinus with some acute and chronic inflammation was found in the soft tissues above the tracheal cartilage.

Experiment 9 was designed to show what tendency there would be for the superficial tissues overlying a large tracheal defect to fill this in and thus occlude the lumen.

Fig. 18.—Gross specimen from animal in experiment 15, showing embedded sutures in anterior tracheal wall.

Experiment 9.—The trachea was exposed in the usual way by a midline incision; a crucial incision was made at the level of the third and fourth tracheal rings, and the flaps thus made were cut away with rongeurs, leaving a round window in the trachea in diameter equal to the width of the trachea. The wound was then closed in layers.

Following the operation, the animal did very well for two days, the wound was sealed off and the skin healed by primary intention. On the third day the animal showed a slight bulging of the wound area, and on the following day this was increased and there was definite fluctuation. The animal became apathetic and was found dead in its cage on the seventh postoperative day.

Autopsy showed a well walled-off abscess, pretracheal in position. There were gross tracheitis and pneumonia.

In spite of aseptic technic there again appeared the same infection, presumably this time arising from within the tracheal lumen. The microscopic appearance of the wound was as follows:

Section IX: Nine sections were made. The most conspicuous feature, in addition to the separation of the anterior tracheal cartilage into two cut sections,

was the finding of an opening in the distal section of cartilage, representing a portion of the window. The epithelium had regenerated. There was no evidence of cartilage regeneration or narrowing of the tracheal lumen. Necrosis of cartilage accompanied by an acute inflammatory reaction was noted. The gaps were again filled in by a connective tissue, associated with congested vessels and acute inflammation.

After three more experiments which went awry, we succeeded in obtaining a wound of four weeks' duration without infection, described as follows:

EXPERIMENT 14.—The trachea was exposed through a midline incision and a window cut out of the trachea at the third and fourth tracheal rings below the cricoid and equal in cross-section to the diameter of the tracheal lumen. The muscles were approximated over this by interrupted silk sutures, the subcutaneous tissue and skin being closed in a similar manner.

The animal did extremely well. At no time did it appear to have been upset by the procedure. The wound healed by first intention and without evidence of infection. On the twenty-eighth postoperative day, the animal was killed by ether.

The gross specimen from this experiment (fig. 16) showed how little tendency there had been for the overlying soft tissue to fill in the cartilaginous defect.

The microscopic features of this wound, shown in figure 17, were as follows:

Section XIV: Three sections were made. The main features were essentially the same as those in section IX, except that the connective tissue was far more dense, indicative of the greater age of the lesion. Again there was no evidence of regeneration of cartilage, the repair process being entirely one of connective tissue replacement covered by regenerated epithelium.

In the final experiment, we attempted to produce a permanent tracheal fistula by suturing the skin edges to the edges of the tracheal window:

EXPERIMENT 15.—The trachea was exposed by a midline incision and a window cut out of the trachea at the level of the third and fourth tracheal rings below the cricoid cartilage. The skin was then sutured to the margins of this window by silk. The remainder of the wound was closed in layers. A permanent air passage was thus attempted. After operation the animal did very well, except that there was a tendency for the opening to crust over, during the first week and thereafter to decrease in size. At the end of the second week it was closed, only a dimpling in the wound remaining. There was then some obstruction to the animal's breathing, perhaps because of a distortion of the trachea, for there was an apparent tendency for the trachea to be drawn forward toward the skin surface as the process of healing progressed.

The animal was killed by ether on the nineteenth postoperative day.

The gross specimen from this experiment (fig. 18) showed the black silk sutures embedded in the mucosal layer, now entirely healed.

Microscopic sections of this wound appeared as follows:

Section XV: Thirteen sections were obtained. The important feature in these was the window, represented by an incompletely repaired defect running from the mucosa through the cartilage and soft tissues. The defect was in part filled in by organization by connective tissue and granulation tissue. A small amount of inflammatory reaction was present. There was no evidence of regeneration of cartilage.

CONCLUSIONS

1. Simple incisions in the trachea, if not infected, tend to heal with great rapidity. The defect is closed by a connective tissue growth, without any evidence of true regeneration of cartilage. The mucous membrane between heals rapidly, though with a modified type of epithelium. There is little if any tendency for encroachment on the tracheal lumen by the healing tissues in this type of wound.

2. The presence of a tracheal cannula delays the healing of the wound and increases the amount of connective tissue formed about it. So long as there is an adequate opening in the trachea for the cannula and no pressure against the cartilaginous edges, there is very little tendency toward the formation of granulations large enough to cause any appreciable obstruction to the tracheal lumen.

3. Infection about the cannula, occasioned primarily by too close approximation of the wound edges about the cannula, increases the tendency to connective tissue formation.

4. With a large anterior tracheal defect there is little tendency for the superficial tissues to fall in and encroach on the lumen of the trachea.

5. With a tracheal fistula, in the absence of a tube, the wound tends to close rapidly without any impairment of the tracheal lumen.

THE INTERRELATION OF ALLERGY AND OTOLARYNGOLOGY *

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Allergy, defined by Pirquet [1] as altered reactivity of cells and tissues, is perhaps the most popular term used to define a large group of unpleasant symptoms affecting about 10 per cent of our population. The word atopy, meaning "strange disease," used by Coca and Cooke [2] to describe these symptoms, is very appropriate, for a strange disease it surely is. The term "vasomotor rhinitis" hardly describes the disease, and if cases thus designated are carefully and properly studied, some specific cause for the symptoms can usually be discovered. Although much that has been said about allergy is purely theoretical, many facts, based on practical observations and experience, are known. I shall not offer any discussion of the theories regarding this disease, but shall confine myself to a consideration of these known facts, especially as they pertain to the joint field of the internist and the otolaryngologist. Too often skin tests alone are relied on for a diagnosis and as an index to treatment, without sufficient consideration of the rôle of the sinuses in the production of the symptoms and of their relation to the treatment.

For this reason, although allergy may affect the cells of any part of the body and produce symptoms referable thereto, the symptoms of chief concern in this paper are those that involve the nose, the sinuses and the tracheobronchial tree.

There is a marked tendency for the disease to occur in a child whose mother and father are both allergic; in such a case the symptoms are more marked, and the treatment is accordingly more difficult. The choice of the right treatment and its success will depend on proper diagnosis, and there is no short route to diagnosis. A definite plan of examination must be followed in every case. A detailed and carefully elicited history is absolutely essential. This should include the family history, a description of the patient's environment and the time at which the first symptoms were noticed. If these symptoms are more marked at night or early in the morning, something in the patient's room or home should

* Submitted for publication, July 29, 1931.

* From the Cleveland Clinic.

1. von Pirquet, C.: Allergie, München. med. Wchnschr. **53**:1457, 1906.

2. Coca, A. F., and Cooke, R. A.: Classification of Phenomena of Hypersensitiveness, J. Immunol. **8**:163, 1923.

be suspected as the cause. If they are worse during the day, something in the patient's occupation may be the causative factor. If symptoms are first noticed during the summer months, the pollens should be suspected. The patient should be asked whether relief has ever been secured by changing his environment. The history alone may determine what protein substance should be suspected.

Next to the history and symptoms, the appearance of the nasal mucosa is important. It will be found to be peculiarly pale and edematous, and when once this sign is fixed in the mind's eye of the examiner, its appearance will always make him suspicious of the presence of allergy. It must also be kept in mind that the appearance of the mucosa over the turbinals and the septum is an indication of the condition of the membrane that lines the sinuses, and therefore the sinuses should be examined carefully. The condition of the sinus mucosa may be due to allergy, and a secondary purulent infection may exist on the surface and in the cavity of the sinus. This is particularly true of cases of long standing. An x-ray picture of the sinus may be misleading if it has been taken during an attack of allergy, and it may not indicate accurately the true thickness of the mucosa, as Proetz [3] has so well demonstrated. By means of the injection of iodized poppy seed oil 40 per cent, Proetz showed a case in which the antral membrane, which had previously been normal in thickness, became thickened a few hours after the patient had suffered an attack of asthma, almost obliterating the sinus cavity.

On the roentgenogram, the allergic membrane may look as if a cyst or polyp were present. I have records of cases in which edema of the nasal mucosa was seen; the membrane fell into folds and gave the characteristic appearance of early polyp formation. On roentgen examination, the maxillary sinuses were found to be opaque and appeared as if granulations were present. I have seen the entire membrane return to its normal appearance and the sinuses become clear as the result of the elimination of the foreign protein, which in one case proved to be derived from feathers.

The next step in the examination should be the skin test, which should be made by one who is especially trained in this work. The proper interpretation of reactions is essential. By referring to the carefully recorded history of the patient, the necessity for a large number of tests may be greatly reduced. Entire reliance should not be placed on the skin reactions, for, as has been indicated, they constitute only one part of the examination. Scratch tests should be made first, and if the reactions are negative, intradermal tests should be made. If positive

3. Proetz, A. W.: Tr. Am. Laryng. A. **52**:256, 1930.

reactions are obtained that coincide with the history and environment of the patient, and if the symptoms of allergy disappear, when he is not allowed to come in contact with the offending proteins, what could be more satisfactory?

But one must be prepared for the following conditions: The skin may be allergic and other parts of the body may escape sensitization, or the reverse may be true; the nasal and bronchial mucosa may be sensitive while the skin is not. In some cases the skin may be hypersensitive and may show multiple reactions even to substances to which the patient is never exposed. This is particularly true in regard to pollens.

The skin tests may be positive when the patient is symptom-free. The patient who presents a typical history and symptoms of allergy and whose reaction to skin tests is negative presents a difficult problem. If on examination of the nasal secretions eosinophils are found in abundance, and if the blood shows eosinophils amounting to more than 4 per cent, the probability that allergy is present is increased. The examination of the stained blood smear for eosinophils must be made by one who is well trained in this procedure.

In the cases studied by my associates and myself we have confirmed the ether reaction of the urine described by Barber and Oriel,[4] which consists of the finding of a proteose substance in the urine during the acute or paroxysmal stage of allergic conditions. However, I do not find that this test can be relied on sufficiently for it to have any diagnostic value.

In the course of the examination, time should be taken to explain to the patient what allergy really is, what a difficult problem it presents, that improvement is not easily attained, and that therefore he must become interested in his own problem, study his own environment and cooperate in every way with the physician. If no positive reactions are found and no infection is found in the sinuses, it may be necessary to resort to eliminative diets.

Every allergist should have a sufficient knowledge of botany to be able to advise his patient how, when and where he can avoid the windborne pollens to which he is sensitive, for he must either do this or be made immune to them by treatment. That bacteria and their products cause sensitization and allergic reactions is questioned by some. I believe that they do, for I have seen cases in which I have felt sure that the teeth and sinuses were responsible. In this connection, the following case is presented.

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4. Barber, H. W., and Oriel, G. H.: A Clinical and Biochemical Study of Allergy, Lancet **2**:1064, 1928.

REPORT OF A CASE

A middle-aged woman had nasal obstruction due to a typical allergic condition of the nasal mucosa. A feeling of tightness in the chest was gradually developing, and a few asthmatic symptoms were present. All skin tests, both scratch and intradermal, gave negative results. The eosinophil count amounted to 6 per cent, and the nasal secretion showed many eosinophils. A roentgen examination of the sinuses showed the left maxillary sinus to be completely opaque, and the presence of a large cyst or polyp was suspected. Cultures from the nasal secretion were made, and a group of nondescript organisms was found. The patient was tested with an antigen made from these organisms, and the reaction was negative. The left antrum was washed, and only a small amount of secretion was obtained, from which a culture was made and Streptococcus was grown. The patient was tested with this antigen, and no reaction was obtained. A culture was likewise made from the stool, and a negative reaction was obtained. The left maxillary sinus was operated on by making an opening through the canine fossa, and a large cyst was exposed, the contents of which were aspirated and implanted on Rosenow's brain broth; the cultures, however, were sterile. A portion of the cyst wall was then implanted on the brain broth, and a streptococcus was grown. When the patient was tested with an antigen made from this streptococcus, the reaction of the skin was positive.

COMMENT

This case bears out a statement that I have made that from an absorptive standpoint the infection within the lining membrane of the sinus is more important than the free pus within the cavities of the sinus.

All cases of bronchial asthma are not due to allergy. A review of 315 cases of bronchial asthma studied at the Cleveland Clinic showed that allergy was present in 164; in 97 definite, proved infection in the nasal accessory sinuses, and in 54 neither allergy nor infection in the sinuses. In this unclassified group, some nervous reflex was believed to be present which imparted undue stimulation to the vagus nerve and the sympathetic nervous system, thus accounting for the asthmatic paroxysms.

It is conceivable that if the nasal and sinus mucosa is allergic for a long period of time, it will become infected and degenerate. The decision as to when an operation should be performed on an allergic sinus always calls for good judgment. If the cause for the allergy is found and eliminated, does the membrane have the power to restore its function? If it has this power, operation should not be performed. In early cases of allergy, operation should not be resorted to until every possible effort has been made to find the cause of the allergy and to remove it. In patients who cannot be relieved from their symptoms as long as their sinuses are filled with infected membrane, operation should be performed. If it is felt that the sensitivity is due to bacteria, operation should be performed.

In some cases of our series, vaccines seemed to be of benefit, cultures being taken from the infected sinus. In bronchial asthma, a culture is also taken from the tracheobronchial tree. Whether these vaccines act in a specific manner or as a foreign protein is a question that I am unable to answer. At the Cleveland Clinic all of the cases have been studied as to the possibility of an endocrine dysfunction, and no basis for glandular extract therapy has been found. The same statement holds true in regard to calcium.

In conclusion, it may be stated that allergy presents an increasingly perplexing problem which requires combined study by the otolaryngologist and the internist and the utmost cooperation on the part of the patient.

OTOLOGIC OBSERVATIONS IN CASES OF INTESTINAL INTOXICATION IN INFANTS*

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The interest of my associates and myself in the subject of intestinal intoxication in infants was first aroused by the statement of various writers that a definite causal relationship exists between this condition and the clinical and pathologic findings in the middle ear and mastoid antrum, the latter being the primary factor. From the start, we were opposed to the view expressed that the otologist should disregard the otologic findings and be guided by the pediatrist in deciding for or against operative intervention. We were reluctant to accept without further substantiation the statement of a number of otologists that the indications for operative intervention could be determined in each instance by definite findings in the ear. In other words, we were rather skeptical that a clinical entity had been established, and that there existed definite reasons for operation on these desperately ill infants.

These little patients were admitted to the pediatric service of Dr. Schick and examined by members of the ear service of Dr. Friesner within twenty-four hours. The general condition of the patients conformed with little variation to the clinical picture described by various pediatrists. Jeans described the pediatric features of this condition by saying:

> The symptoms in general consist of a marked and rapid loss of weight, fever, diarrhoea, dehydration and the appearance of intoxication. The intoxication is characterized by drowsiness or stupor and pallor with a grayish hue; it may appear simultaneously with the fever or follow it in a few hours. The temperature curve is inconstant; when fever existed previously, a secondary increase may occur. Diarrhoea usually parallels and coincides with the dehydration and weight loss. Sometimes the onset of diarrhoea is slightly delayed, and in a few otherwise typical cases diarrhoea has been absent. Usually there are from eight to twenty mucus-containing foul smelling stools daily. The dehydration is reflected in the weight loss and the loss of skin elasticity; it is sometimes of such a marked degree as to cause the appearance of extreme emaciation. The leucocyte count has varied from 13,000 to 30,000 or more. Vomiting may occur throughout the course of the illness, with varying degrees of severity. Refusal of food is a fairly constant feature. Marked degree of acidosis has been noted.

In the best interest of a thorough study of this subject, we decided that the ears were to be examined by the same otologist daily, the findings to be recorded by him. The pediatrists were in full accord with

* Submitted for publication, July 28, 1931.

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our stand that operative interference was not to be resorted to unless definite otologic indications presented themselves. The method employed in this investigation can best be illustrated by detailing the findings in ten of the cases. All of the others (twenty-nine) were studied with the same thoroughness.

Our investigation covered a period of two and one-half years and included a detailed study of thirty-nine cases. Observations and studies made before this period are not included, as the case records were incomplete.

An analysis of the aural findings in the thirty-nine cases of intestinal intoxication shows:

Cases in which patient died, 22 (cases 5, 7, 13, 23, 24, 25, 26, 30, 31, 32, 33, 2, 3, 4, 36, 37, 38, 39, 40, 41, 17 and 18):

Normal drum, 16 (cases 2, 3, 4, 5, 7, 23, 24, 25, 26, 30, 31, 32, 33, 36, 39 and 40)

Marked changes in drum, 3 (cases 13, 38 and 39)

Minor changes in drum, 3 (cases 17, 37 and 41)

Cases in which patient recovered, 17 (cases 1, 6, 8, 9, 10, 11, 12, 14, 15, 16, 19, 20, 21, 22, 27, 28 and 35):

Normal drum, 7 (cases 1, 8, 9, 10, 20, 27 and 28)

Minor changes in drum, 5 (cases 11, 12, 14, 21 and 22)

Marked changes in drum, 5 (cases 6, 15, 16, 19 and 35)

Normal wall of canal, 17

Our impressions from a careful study of these cases are in accord with those expressed by Wishart [1] in a splendid paper detailing his experience and conclusions. In my rather limited experience, I have not been able to establish a clinical entity warranting such startling claims as were announced by various writers until rather recently. The work of Alden and Lyman,[2] Dean,[3] Marriott [4] and Jeans and Floyd [5] has caused a great renewal of interest in this question and, in some instances, alarm lest overenthusiasm lead to indiscriminate operations without due and careful regard to study and diagnosis in individual cases.

Our experience coincides with Wishart's in many respects. We, too, noted that a majority of the infants presenting symptoms of intestinal

1. Wishart, D. E. S.: Relation of Infection of the Ear and Infection of Intestinal Tract in Infants; Results of a Five Years' Study, J. A. M. A. **95**:1084 (Oct. 11) 1930.

2. Alden, A. M., and Lyman, H. W.: Gastro-Intestinal Disturbances in Infants as Result of Obscure Infection in Mastoid, Laryngoscope **35**:586 (Aug.) 1925.

3. Dean, L. W.: Acute Otitis Media in Infants; Its Influence on Certain Systemic Conditions and Influence of These Conditions on Method of Treating Coexisting Acute Otitis, Arch. Otolaryng. **6**:201 (Sept.) 1927.

4. Marriott, W. McKim: Further Observations Concerning Nature of Nutritional Disturbances, Laryngoscope **35**:592, 1925.

5. Jeans, P. C., and Floyd, M. L.: Upper Respiratory Infections as a Cause of Cholera Infantum, J. A. M. A. **87**:220 (July 24) 1926.

General Data on Case (No., Patient's Name, Age, Illness, Date of Admission)	Date	Changes in Canal	Appearance of Drum		General Condition of Patient	Postmortem Observations (When Obtained)
			Right	Left		
1. A. A., 4 mo.; diarrhea, 2 wk.; vomiting, 3 wk.; course progressively worse; temp. 99 to 103 F.; complications: otitis media, acidosis and loss of weight	8/12	.....	Red and flat; shrapnell flat; short process visible; no light reflex; no discharge	Gray; shrapnell flat; short process not visible; no light reflex; no discharge. Result of paracentesis: Thin serous fluid obtained. Culture: Staph. albus	Temp. 102 F.; infant seemed improved, no longer acidotic, taking food a little better; ears still full; nose and throat negative	
	8/13	.....	Red; shrapnell fuller; short process less marked; no light reflex; drum full; no discharge	Gray; shrapnell flat; short process not visible; no light reflex; no discharge	Temp. 100-102.6 F.; infant seemingly drowsy; diarrhea 5 times daily; condition seemed worse; nose and throat negative	
	8/14	.....	Dull; shrapnell flat; short process less marked; no light reflex; drum bulging; no discharge. Result of parasentesis: pus obtained. Culture: Staph. albus	Dull; shrapnell full; short process absent; no light reflex; drum bulging; no discharge. Culture: Staph. albus	Temp. 100-103 F.; infant getting better; stools 4 times daily; condition seemed better; nose and throat negative; weight 9 lb. 6 oz. (4.25 Kg.)	
	8/15	.....	Flat; shrapnell normal; short process present; no light reflex; drum flatter; no discharge	Gray; shrapnell flat; short process absent; no light reflex; drum flatter; ear discharging freely	Condition improved; taking food better; nose and throat negative; weight 10 lb. (4.5 Kg.)	
	8/19	.....	Gray; shrapnell normal; short process sharp; no light reflex; drum flatter; no discharge	Red; shrapnell flat; short process beginning to appear; no light reflex; drum full posterior; no discharge	General condition greatly improved; amount and number of feedings increased; nose and throat negative; weight 10 lb. (4.5 Kg.)	
	8/20	.....	Improved	Improved	General condition better; nose and throat negative; weight 10 lb. 2 oz. (4.55 Kg.)	
	9/ 1	.....	Improved	Improved	Discharged well	
5. A. P., 5 mo.; vomiting, 2 days; diarrhea, 2 days; no fever; course progressively worse; complication, otitis media. Admitted 8/5/29	8/ 5	.....	Dull and red; shrapnell normal; short process visible; no light reflex; no discharge	Deeply injected; shrapnell flat; short process barely visible; no light reflex; no discharge	Infant extremely toxic, eyes sunken; high temperature; condition slightly better than on night of admission to hospital	
	8/ 6	.....	Dull and thick; shrapnell flat; short process present; no light reflex; no discharge	Dull and thick; shrapnell flat; short process barely visible; no light reflex; no discharge	Infant slightly improved over above condition; weight 14 lb. 2 oz. (6.45 Kg.)	

	8/ 6	Dull and thick; shrapnell flat; short process present; no light reflex; no discharge	Dull and thick; shrapnell flat; short process barely visible; no light reflex; no discharge	Infant slightly improved over above condition; weight 14 lb. 2 oz. (6.45 Kg.)	
	8/ 7	Same as above	Same as above	General condition much better, less toxic; eyes less sunken; no vomiting; only 3 stools daily; both ears still inflamed; weight 14 lb. 1 oz. (6.42 Kg.)	
	8/ 8	Ears improved	Ears better	Infant less toxic; condition of ears resolving	Intestinal toxemia; hypostasis of lungs; congestion of intestines; parenchymatous degeneration of heart, liver and kidneys; follicular hyperplasia of intestines; histologic examination showed normal antrums and middle ears
	8/10	Ears improved	Ears better	General condition worse, though both ears look better	
	8/11	Ears improved	Ears better	Infant in extreme cyanosis, with râles; weight 13 lb. (5.9 Kg.); died	
6. M. R., 5 mo.; diarrhea, 5 days; vomiting, 2 days; fever; course progressively worse; complication, acidosis	8/23	Normal; shrapnell flat; short process present; light reflex present; no discharge	Same as right	Infant toxic, apathetic; eyes sunken; 5 yellowish watery stools; very restless; no fever; some signs in lower part of left lung; acidotic	
	8/24	No change	No change	Not so toxic; no vomiting	
	8/26	Full; shrapnell slightly full; short process not visible; no light reflex; scant discharge	Full; shrapnell full; short process absent; no light reflex; thin, scant discharge	General condition better; no vomiting; temperature down; seemingly much improved; not very toxic	
	8/29	Red and full; shrapnell full; short process present; no light reflex; no discharge	Full; shrapnell full; short process present; light reflex present; no discharge	General condition improved; no vomiting; temp. 100 F.	
	9/ 1	Full; shrapnell flat; short process present; light reflex present; no discharge	Full; shrapnell flat; short process present; light reflex present; no discharge	General condition improved; infant has cough; temp. 103 F.; throat red; some râles in chest; losing weight	
	9/ 4	Normal	Normal	Temperature down; no vomiting; stools improving; infant much better	
	9/12	Normal	Normal	Infant steadily improving	
	9/15	Normal	Normal	Infant steadily improving; well	
7. R. R., 9 mo.; diarrhea, 1 wk.; vomiting, 1 wk; temp. 100.6 F.; course progressively worse; complication, acidosis. Admitted at night, 8/26/29	8/27	Flat; shrapnell normal; short process present; light reflex present; no discharge	Same as right	General condition very poor; Kusmal breathing; child stuporous; cries out with pain; given transfusion; died	Ears, antrums and mastoids normal; parenchymatous degeneration of liver and kidneys

Observations on Ten Infants Suffering from Intestinal Intoxication—Continued

General Data on Case (No., Patient's Name, Age, Illness, Date of Admission)	Date	Changes in Canal	Appearance of Drum		General Condition of Patient	Postmortem Observations (When Observed)
			Right	Left		
18. H. R., 7 mo.; vomiting, 3 days; diarrhea, 6 days; course progressively worse; complication, pharyngitis. Admitted 9/17/29	9/17	.....	Normal	Normal	Poorly developed patient with depressed fontanels; tongue puffy and red; no exudate; throat injected and inflamed; cyanosis	Bronchopneumonia of lower lobe of left lung and at base of right lung; slight parenchymatous degeneration of liver and kidneys; ears normal
	9/18	.....	No evidence of disease	No evidence of disease	General condition much worse; acute pharyngitis; temp. 106.4 F.; cyanosis; subcutaneous injection of Ringer's solution; no improvement in patient; died	
23. H. L., 8 mo.; diarrhea, 10 times a day for 3 days; vomiting, 3 days; convulsions, 2; fever. Admitted 9/19/30	9/19	.....	All landmarks visible; no bulging; no redness; depressed fontanels only indication for paracentesis	Same as right	Child almost moribund, in collapse, comatose, clammy; nose and throat negative; carbon dioxide in blood 21% to 42%; child died after 26 hours in hospital, despite continuous transfusion therapy (transfusion of 80 cc. of blood)	
24. K. C., 10 mo.; diarrhea 5 to 6 times a day for 6 days; vomiting, 6 days; fever, 103 at onset; drowsiness, 2 days; acidosis. Admitted 9/24/30	9/24	.....	Normal	Normal	Child almost moribund; given 250 cc. of 5% dextrose intravenously; depressed fontanels; signs of pneumonia; nose and throat negative; died	Ulcerative enterocolitis; acute infection of splenic tumor; degeneration of liver and kidneys; terminal pneumonia
25. P. F., 12 mo.; diarrhea and enlarged abdomen, 1 wk.; vomiting 3 days; fever. Admitted 8/25/30	8/25	.....	All landmarks visible except for slight fulness in posterior quadrant	Same as right	Child poorly nourished, irritable; rickets; enlarged liver and spleen; acidosis; carbon dioxide determined as 14% by volume; x-ray photograph of chest negative; Pirquet test negative; depressed fontanels; nose and throat showed some crusts and slightly injected mucosa; died Aug. 29	Intestinal enteritis (clinical); parenchymatous degeneration of liver and kidneys; slight dilatation of right ventricle; follicular hyperplasia of colon and rectum
28. G. F., 4 mo.; diarrhea, 2 days; vomiting, none; irritable; not toxic. Admitted 8/7/30	9/ 7	.....	Normal	Normal	Continuous intravenous injection of 5% dextrose; 235 cc. Ringer's solution subcutaneously; intravenous blood serum	

days; vomiting, none; irritable; not toxic. Admitted 8/7/30					injection of 5% dextrose; 235 cc. Ringer's solution subcutaneously; intravenous blood serum
	8/14	.....	Somewhat thickened; except for light reflex, all landmarks present; no indication of disease	Same as right	Infant afebrile; not toxic; stools reduced to 2 to 3 per day; no vomiting
	9/ 4	.....	.....	.....	Discharged well
	9/11	.....	.....	.....	Followed up and found to be doing well
35. W. R., 5 mo.; discharging ears, 10 days; vomiting and diarrhea, 2 days. Admitted 9/1/30	7/10	.....	Thin, purulent discharge; tubal perforation; landmarks visible Thin discharge; drum flat	Flat; landmarks visible	Irritable; general condition fair
	7/14	Considerable swelling of anterior external canal and below (?); pressure on antrum; swelling did not resolve on appearance of discharge in canal; no changes in bony wall	Same as right		
	7/15	.....	.....	.....	Preauric swelling in ears; pus obtained; glands palpable
	7/18	.....	.....	.....	Erysipelas on right side of face
	7/20	.....	.....	.....	Still had diarrhea
	9/ 1	.....	.....	.....	No diarrhea on admission on this date; slight nasal discharge; infant apparently acutely ill, though not toxic; given transfusion; improved
	9/ 7	.....	Flat, of good luster, not red, not bulging; all landmarks present	Same as right	
	9/10	.....	Ears that formerly were normal beginning to show changes	.....	No diarrhea; infant beginning to cry more
	9/11	.....	Thick, full, acutely inflamed; no landmarks; myringotomy done here; thin seropurulent discharge. Culture not reported	Thick	No diarrhea; treatment continued as usual; transfusion given
	9/12	Right ear discharging	.....	.....	No diarrhea; infant beginning to improve; number of stools less; nose and throat improved
	10/17	.....	.....	.....	Discharged well

intoxication were without evidence of infection of the upper respiratory tract at the time they were toxic, and that many of them at no time during their illness gave evidence of any aural infection. We are inclined to agree that accumulations or infections found in the mastoid antra of infants at autopsy are antemortem in origin. Alexander [6] stated that after death the tissues undergo rapid decomposition from putrefaction, filling the tympanic cavities of infants with a gelatinous, more or less purulent fluid.

The drums frequently show abnormality before death. Such a change may be ascribed to an antemortem phenomenon resulting from forcible ejection of fluid into the eustachian tube or from marked dehydration of the tissues. Should mastoid infection occur under these conditions, it may be regarded as a result and not the cause of the clinical picture of intestinal intoxication. Wishart presents two intensively studied series of cases of intestinal intoxication that had come to autopsy. The findings showed that mastoid infection was not common. Histopathologic studies of our cases by Druss [7] confirmed our clinical impressions that intestinal intoxication in infants is not of otitic origin.

We could obtain only temporal bones for histopathologic section in seven of our cases. In many of the cases, we were able to open the middle ears and antrums. In some of these cases, exudate was found in the middle ears and antrums. There was no gross evidence of necrosis of bone. Of the seven temporal bones obtained for complete histologic study, four showed the tympanic membrane essentially normal; in the remaining three, suppuration of the middle ear was present. In the four cases in which there were normal clinical findings, histologic examination showed normal or slight changes in three; in one, purulent exudate was demonstrated in the antrum. In none of the seven cases was there histologic evidence of necrosis of bone.

In the three cases in which there was a discharge from the middle ear, pathologic changes, from a moderate exudate in the tympanum and antrum to a diffuse labyrinthitis (one case), were seen. In the latter there was no evidence of necrosis of bone, the portal of entry to the labyrinth being the oval window. The details of the pathologic findings and their relation to the clinical picture are described by Druss in a paper to be published soon.[7]

In two of the three cases of aural suppuration, the intestinal symptoms antedated the onset of the involvement of the ear by two and three weeks, respectively. In the third case, involvement of the middle ear was of two weeks' duration, whereas the intestinal symptoms had been present for four weeks.

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6. Alexander, G.: Die Ohrenkrankheiten im Kindesalter, Leipzig, F. C. W. Vogel, 1927, p. 103.

7. Druss, J. G.: Infection of the Ear in Cases of Infection of the Gastro-Intestinal Tract in Infants, Am. J. Dis. Child. **43**:356 (Feb.) 1932.

No one will dispute the claim that every infant, with or without signs pointing definitely to the ears, who has fever, diarrhea lasting more than a day or two or any intestinal disturbance should have a careful and thorough aural examination. If infection of the ear is found, prompt institution of drainage is indicated, and if myringotomy with free drainage fails to relieve the situation, postauricular drainage is indicated if aural examination warrants such a procedure. Copious, prolonged, increasing or at least nondiminishing aural discharge is in itself suggestive of mastoid involvement. In the vast majority, further evidence of postauricular involvement will be found on careful examination.

The following otologic observations have been made as a result of a study of these and other cases of intestinal intoxication in infants; these conclusions have a direct bearing on the subject under discussion and tend to confirm our view that intestinal intoxication in infants is not of aural origin:

Acute infection of the middle ear and mastoid is of frequent occurrence in infancy, and yet gastro-enteric symptoms are not commonly encountered in its course.

Normal middle ears were present throughout in a majority of our cases of intestinal intoxication.

A comparatively small number showed evidence of an acute otitis media that improved later, the symptoms of intoxication, however, remaining unchanged or becoming worse. Changes in the ear drums frequently occur in the agonal stages of many diseases.

In a number of cases, the acute suppurative diseases of the middle ear apparently had no direct bearing on the presence of symptoms of intestinal intoxication, either antedating the onset of intestinal symptoms by one or more weeks or occurring independently late in the course of the intestinal complaint.

Pathognomonic changes in the wall of the bony canal described by various writers were not observed in our cases.

Accumulations in the middle ears or in the mastoid antrums of infants at autopsy are antemortem in origin.

Histopathologic examination of the middle ears and mastoids in a number of our cases failed to show any unusual observations.

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PNEUMOCOCCIC MEMBRANOUS NASOPHARYNGITIS IN INFANTS *

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The occurrence of a pseudomembrane on the mucosa of the nose, pharynx, mouth and adnexa of infants, caused by the pneumococcus and associated with grave prostration, presents as definite a clinical entity as diphtheritic nasopharyngitis. The physical findings in this condition so closely resemble those of diphtheria that differentiation can take place only through bacteriologic examination of mucosal exudates. It is significant that in all the cases that I am reporting the patient had been treated for diphtheria before more detailed investigations were made.

Woody and Kolmer,[1] in 1911, described the findings in seventy-four cases of pneumococcus nasopharyngitis. They divided them into three groups as follows: (1) cases with well marked tonsillar exudates, (2) cases showing redness and edema of the parts without an exudate and (3) a rare type characterized by perforating ulcer of the soft palate and ulcers of the buccal mucosa. They stated that the ulcerative types were met in undernourished and otherwise impoverished patients, but made no mention of age incidence. The cases that I am describing are those of infants under 2½ years of age, who until their illness (except in one case, which was preceded by measles) were entirely normal. I have seen a number of adults afflicted with the same condition, and though the physical findings were similar, the course, complications and sequelae were quite different. For instance, dehydration, which occurs so rapidly in infants of this age and which apparently is a great factor in the severity of the disease, is not so important in older patients who will voluntarily take fluids.

H. Glaser [2] recently reported two cases of pneumococcic nasopharyngitis, one in a boy 4 years old and the other in a girl 3 months old. Both were previously healthy. The boy died at the end of two weeks, while the girl recovered. The disease in the infant was ushered in by a diarrhea. Bert and Riser [3] also reported two such cases in

* Submitted for publication, July 31, 1931.

1. Woody and Kolmer: Membranous Naso-Pharyngitis, Arch. Pediat. **28**:500 1911.

2. Glaser, H.: Pseudomembranous Nasopharyngitis, Monatschr. f. Kinderh. **47**:169, 1930.

3. Bert and Riser: Pneumococcus False Diphtheria, Arch. de méd. d. enf. **26**:671 (Nov.) 1923.

infants 1½ years old, in which the disease was ushered in by a diarrhea. I did not encounter this symptom. The authors failed to mention the finding of pneumococci in the stools.

Chalier and Mestrallet [4] reported two cases of pneumococcic angina in adults, one a youth of 19 years and the other a man of 37 years. Though the findings and course of the disease in their patients were somewhat similar to those noted in the cases that I am reporting, the picture was not nearly so grave. Their two cases resulted in recovery. These authors also mentioned a case of Jaourd's [5] in an adult showing similar findings to theirs. In adults, this condition rather simulates malignant ulcerative tonsillitis with its severe angina, generalized muscular and arthritic pains and prostration, with complete recovery after a week or ten days.

ETIOLOGY

According to Woody and Kolmer, Bacillus mucosus capsulatus occurs in about 60 per cent of all healthy mouths. To all appearances, even culturally, the organisms found in the mouth are similar to the pneumococcus of the nasopharyngeal flora.

Pilot and Pearlman [6] reported the presence of pneumococci in 65 per cent of adenoids examined after removal in a group of 103 cases. Cultures from the tonsils revealed pneumococci in 66.6 per cent of twenty-one patients, while 71.4 per cent of the same persons harbored pneumococci in the adenoids. These cases were for the most part in children. It is not unlikely, then, that under suitable environment, an overgrowth of this organism might occur. As I mentioned previously, no other predisposing factor was noted in my cases, except in one baby who was recuperating from an attack of measles. I observed four patients all of whom were 2½ years of age or less. All had been unusually healthy and were breast fed until 6 months old. They were of normal weight, height and bone development. With the exception of one, they had had periodic management by competent pediatricians. In none was there a history of throat or cervical glandular troubles. All the cases occurred during the "cold" seasons, i. e., spring, fall and winter. The social conditions were good: All the patients came from well ventilated, clean homes and were of intelligent American parentage. In two homes, other young children were present, but no transfer of the infection took place. None had been immunized to diphtheria. The organisms were typed in three cases; two were type I and the other type II. The course of the infection in these cases, however, was about

4. Chalier, J., and Mestrallet: Marked Pseudomembranous Pneumococcic Angina Simulating Malignant Diphtheria, Lyon méd. **140**:530 (Nov.) 1927.

5. Jaourd: J. de méd. et chir. prat., 1891.

6. Pilot and Pearlman: Bacteriologic Studies of the Upper Respiratory Passages, J. Infect. Dis. **29**:47, 51 and 55, 1921.

the same. All the patients had been hospitalized except the one recovering from measles, and this child died of a pneumococcic meningitis. However, one of the hospitalized infants died of pneumonia.

All of these cases began as membranous tonsillitis which gradually spread into the adjacent mucous membrane.

PATHOLOGY

The changes noted on the mucous membranes were not greatly different from those noted in diphtheritic pharyngitis except for the tendency to spread into the mouth. The membrane on the tonsils was yellow and tenacious, and left a bleeding surface on removal. The membrane in the mouth appeared gray or a dirty yellow. It extended over the tonsils, nasal and pharyngeal mucosa, spreading along the gingival margins, the overhanging soft and hard palate and the internal surface of the lips. It was found well up on the buccal surface of the cheeks, in which area numerous small, round, discrete-edged, dirty ulcerations occurred. In two cases, the skin about the mouth was reddened and swollen. All presented numerous fissures of the lips, the wounds being covered by the same dirty yellow membrane noted in the mouth. Two cases also presented involvement of the eyes. The conjunctiva was deeply injected, swollen and covered with a yellow exudate.

The nasal mucosa in all cases was covered by a yellow fibrinous exudate which completely occluded the cavities. Microscopic examination of the membranes revealed bundles of pure fibrin, the interspaces of which were literally loaded with white cells and pure growths of encapsulated, lanceolate gram-negative diplococci. As the membranes resolved, a thick yellow purulent exudate resulted. This was so tenacious that it was impossible to aspirate it. With the absorption of great amounts of fluid, this exudate seemed to break down further into a less tenacious yellow purulent material which was easily aspirated.

SYMPTOMS, COURSE AND COMPLICATIONS

Unlike diphtheria, the onset of pneumococcic nasopharyngitis is very stormy. The temperature rises quickly to 104 F. or higher, and the child quickly becomes toxic. Opisthotonos is usually present, though other evidence of meningeal irritation is absent. The child refuses food or water, and dehydration occurs rapidly, giving the typical marasmic appearance. The skin becomes dry, the lips are parched and fissured, and about the fissures occur masses of dirty yellow exudate. Bleeding often occurs from the mouth, nose and lip lesions.

The pulse is very rapid and weak, but regular. The conjunctiva becomes involved, presenting a very deep hyperemia, with much croupous exudate matted about the eyelashes. Both the anterior and posterior

groups of cervical glands are enlarged and painful to the touch. The latter condition is probably responsible for the opisthotonic posture of the child. As the membrane breaks down, thick yellow material is deposited in the pharynx and larynx, making breathing very difficult, so that frequent aspiration must be resorted to, to prevent strangulation.

In spite of all measures, the condition per se persists for from ten days to three weeks, during most of which time some membrane remains.

The complications are varied. Pneumonia developed in two patients, one of whom died during the third week; in one of these two cases a bilateral otitis media developed which persisted for eight weeks, finally resolving without operative intervention. A third patient died of meningitis on the seventh day. This child was recuperating from measles. The fourth child developed a pansinusitis, bilateral otitis media and acute dacryocystitis. All these conditions cleared up, except the antrum infection, for which a simple antrotomy was done six months later, with complete recovery.

DIAGNOSIS

The differential diagnosis of this condition must include only the serious anginas, in the following order: diphtheria, malignant ulcerative tonsillitis (streptococcus), Plaut-Vincent's infection, agranulocytic angina and the anginas associated with other blood dyscrasias and extreme debility. A definite diagnosis can be made only by the identification of the pneumococcus.

PROGNOSIS AND TREATMENT

The prognosis, when early recognition of the condition occurs, seems good. Unfortunately, the condition so closely resembles diphtheria that the clinician treats it as such, though cultures are negative, until he realizes the futility of antitoxin. In large cities where throat smears are sent to central municipal laboratories and reports are given only as to the presence or absence of the diphtheria bacillus, it is, of course, easy to make this mistake.

In diphtheria, treatment is directed for the most part toward neutralization of the deadly neurotoxin, which is produced early in the disease. The complications are of comparatively minor consequence, particularly since intubation has been practiced. In pneumococcic nasopharyngitis, on the other hand, because of the very rapid spread of the membrane onto every contiguous surface, the treatment must be directed toward localizing the infection in the throat. The complications here are far more serious to combat than the initial lesion with its toxemia. It is not unlike pneumococcus pneumonia, which rarely kills through sepsis, but rather through interference with proper functioning of the lungs.

The great problem when the disease is found in infancy, as in my cases, is to prevent dehydration, which occurs rapidly because of the refusal of the infant to take any sort of nourishment. It is therefore best, as soon as the condition is recognized, to hospitalize the child so that various methods, such as proctoclysis, hypodermoclysis, intraperitoneal injection of fluid and intramuscular injections of the parents' blood may be started at once.

Locally, hourly applications of 1 per cent ethylhydrocupreine to the nose and throat by the dropper and spray method should be instituted. The mucous membrane of the mouth and lips should be moistened every few hours with a dripping swab of the same solution. Ethylhydrocupreine base, because of its lesser toxicity when absorbed, may be used in large quantities on internal surfaces. The hydrochloride, however, is rather toxic and should be used externally only. It is well to apply it frequently to the skin surfaces about the mouth, and to drop it into the conjunctival sacs, since these areas rarely escape involvement. When resolution and breaking down of the exudate occur, frequent aspiration of the nose and throat should be carried out. Heindle reported immediate resolution in two cases following the injection of 400 Gm. of Merck's antipneumococcic serum. I did not try antipneumococcic serum in any of these cases because the patients appeared to do well on other treatment. It is quite possible that the use of the Felton serum might have prevented the complications that occurred. It must be remembered, however, that the antipneumococcic serum is not an antitoxin but rather a bactericide, and its proved value lies in its ability to sterilize the blood stream in type I and II infections. When a bacteremia occurs in cases of the types mentioned, the serum may be of value. I am unable to give any data concerning the local use of this serum on mucous membranes.

The complications are treated as they occur. Suction is, of course, preferable to an operation on the sinuses in infants, but irrigation of the antrum may become necessary.

The general treatment consists in maintaining the water balance and keeping the child warm, protected from draughts and properly nourished. This is best accomplished by the pediatrician who should manage these cases along with the otolaryngologist.

REPORT OF CASES

CASE 1.—M. H., an unusually healthy girl, aged 2½ years, was awakened by a severe "mouth pain," as she expressed it. The following day, a pediatrician was called who made a culture and tentatively diagnosed the condition as diphtheria. The child was given 20,000 units of antitoxin. The following day, the pediatrician called again and, seeing no change in the condition, gave another 20,000 units of antitoxin. Meanwhile, the culture was reported negative for Klebs-Löffler bacilli. The temperature went up to 104.4 F., and the child became extremely toxic,

refusing all nourishment. On the fourth day, 20,000 units of antitoxin was given, but again without any change in the patient's condition. It was felt that the laboratories might have erred, so other cultures were made, but all were returned negative for Klebs-Löffler bacilli. The patient became much worse, and the parents asked for a throat consultant. I saw the child on the sixth day of the illness. The temperature was 104.8 F.; the child looked and acted very sick. There was some rigidity of the neck, but no positive Kernig or Brudzinski signs. She was having some respiratory difficulty, but nothing extreme. The skin about the mouth and nose was reddened, and the lips were dry and cracked, with much yellow exudate in the fissures. There was a profuse yellow discharge from the nose. Oral examination revealed a grayish-yellow membrane together with shallow

Chart 1.—Temperature, respiration and pulse rate curves in case 1.

ulcerations involving the gingival margins, the buccal surfaces of the mouth and the overhanging soft palate. The tonsillar and oropharyngeal areas were covered with this same yellow membrane. Nasal examination revealed masses of bloody exudate in both nares. Separation of the membrane in the pharynx left a bleeding area. The membrane was teased out on a slide and examined under the microscope. It consisted of pure fibrin, in whose meshes were hosts of gram-positive lanceolate diplococci. The white blood cells numbered 24,000 and the red cells 4,000,000. The urine was normal. The child was removed to the hospital and placed under the regimen previously outlined in this paper. Her course in the hospital was rather stormy. The usual pneumococcic conjunctivitis and pansinusitis developed. Her temperature and pulse rate are shown in chart 1.

After dismissal from the hospital, she developed a bilateral otitis media which cleared up after three weeks. The sinuses continued to drain, and she developed

in addition an acute dacryocystitis. This was incised and healed without fistula formation. The antrums remained affected until six months later, when they were opened and tubes put in. After four weeks of drainage, they finally healed.

Case 2.—F. T., age 1½ years, was taken sick with a sore throat. He had been a normal full term baby, breast fed up to 6 months of age and constantly under a pediatrician's general care. He had had no previous illness. I was called in on the fourth day of the illness, and found a very sick male infant with a temperature of 104.6 F. He was markedly dehydrated, breathing heavily and almost comatose. The skin was dry, and there was evidence of recent loss of weight. About the nares and mouth were excoriations, and the lips were fissured, the latter having a covering of grayish-yellow exudate. The eyelashes were matted together,

Chart 2.—Temperature, respiration and pulse rate curves in case 2.

and a yellow exudate was present at both internal canthi. Both ears and the nose were discharging a yellow purulent material. The anterior and posterior cervical glands were markedly enlarged. Opisthotonos was present, and there was a suggestion of a positive Brudzinski sign. Kernig's sign was negative. The chest and reflexes were normal, and all other findings were negative except for a wasted appearance of the integument of the arms, legs and body in general.

Examination of the mouth revealed a thick yellow tenacious exudate over the area of the hard palate. There were numerous shallow ulcerations on the buccal and gingival surfaces of the mouth. Both tonsils, the pharynx and the overhanging palate were covered with a yellow thick membrane. This membrane also occluded both nares.

Examination of all exudates revealed a type II pneumococcus in pure culture. The urine and spinal fluid gave normal results in culture, cell count and protein

tests. The white blood cells numbered 22,900 and the red cells 4,500,000. Pirquet's reaction was negative. After the third day of hospitalization the child became brighter and began to take food. He remained in the hospital for nine more days, during which time his temperature gradually dropped to 99 F. On the fourth day after his discharge he developed pneumonia and was returned to the hospital for another three weeks. In the meantime the aural condition became worse and finally resulted in a breaking down of both mastoid bones.

He was taken sick on December 25, was fully recovered from the nasopharyngitis by January 10, but suffered from the complications for an additional ten weeks, finally recovering completely. His temperature curve appears in chart 2.

CASE 3.—This case occurred in a girl (R. A. L.) aged 2 years. The history, as related by Dr. Palmassano who called me in consultation, was as follows:

Chart 3.—Temperature and respiration curves and pulse rate in case 4.

The child took sick on January 1 with typical measles, being attended by another physician. On January 6, the patient's fever rose to 104 F., and Dr. Palmassano was called in. He communicated with the other physician, who informed him that diphtheria had developed on the fourth day of the child's illness, and that he had administered 10,000 units of antitoxin. Meanwhile, the culture had been returned by the health department laboratories as negative for Klebs-Löffler bacilli. A second culture had likewise been returned as negative. I saw the child on January 8. She was very much dehydrated and stuporous, and had a temperature of 104.4 F. The neck was rigid, and both the Kernig and Brudzinski signs were positive. There were petechial hemorrhages about the body. Numerous râles were present at the bases of both lower lobes of the lungs. The skin about the mouth, nose and eyes was excoriated, and the lips were fissured. The buccal and gingival

surfaces of the mouth were ulcerated and covered with a yellow tenacious exudate. On the tonsils, overhanging palate and pharynx was a heavy membrane. This also was present in the nose. The white blood cell count was 28,000 and the red cell count 4,000,000. The urine revealed albumin +++, many casts and pus cells and a positive indican reaction. The parents refused a spinal puncture. Smears from the exudate about the eyes, nose and throat revealed a pure growth of pneumococcus. Because the child was in quarantine for measles, she was refused admission to the hospital, but the usual regimen was attempted at home. She grew rapidly worse, however, and died of meningitis on January 12.

CASE 4.—T. A., aged 1 year, weighed 7½ pounds (3.4 Kg.) at birth (a breech delivery), was breast fed up to 6 months of age and had been getting cod liver oil daily for the past eight months. The referring physician, Dr. Modica, stated that the child had been in good health until the present illness. He had been examined regularly, and was known as a "good" baby. For the past eight days he had had a nasopharyngitis, had been very restless and finally had become stuporous, so that it was necessary to hospitalize him. His temperature on admission to the hospital was 104.8 F. I saw him on the ninth day of his illness. He presented the identical appearance of the baby described in the previous case. The results of laboratory tests were: white blood cells, 20,400; red blood cells, 4,000,000; urine: a small amount of albumin with bacteria; spinal fluid: normal cell count, culture and protein tests. Smears and cultures from exudates revealed a type I pneumococcus.

He was placed on the usual regimen, and progressed favorably until the sixth day, when pneumonia developed, and he died six days later. A record of his temperature appears in chart 3.

SUMMARY

Membranous pneumococcic infection of the nasopharynx appears as a definite entity in infants.

Successful treatment hinges on an early diagnosis and rapid amelioration of the dehydration that occurs in these infants.

LOCAL ANESTHESIA IN TONSILLECTOMY*

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BUFFALO

Local anesthesia of the tonsil as commonly practiced is done without much regard for the exact location and distribution of the nerves that supply the tonsil. The anesthetizing solution is usually introduced through a number of punctures around the circumference of the tonsil in an attempt to flood the spaces in this area and in this way reach all sensory nerves.

This method is usually successful, but occasionally it fails to produce complete anesthesia. The multiple punctures and the large quantity of anesthetizing fluid used distort anatomic relationships, interfere with careful dissection and sometimes make the enucleation of the tonsil difficult. The increased traumatism due to the numerous needle punctures and the water-logged tissues caused by the large amounts of anesthetic solution interfere with the process of repair.

The study here reported was undertaken to determine whether the arrangement of the sensory nerves entering the tonsil is such that a method of "nerve block" could be employed. Such a method would reduce the number of needle punctures and the large amount of solution required.

NERVE BLOCK

Considerable difference of opinion is given by associates in regard to the definition of nerve block or nerve blocking. Labat[1] classified regional anesthesia by two different types of procedures: nerve block and field block. Nerve block consists in making injections in close proximity to the nerves the conductivity of which it is desired to cut off. Field block consists in creating walls of anesthesia encircling the operative field. I choose to call my method "nerve block," because it cuts off definite nerve pathways that enter the tonsil.

THE ANATOMY

It is interesting to know that Fowler and Todd,[2] by their recent careful studies, have thrown light on the important question of the

* Submitted for publication, Sept. 14, 1931.
* From the University of Buffalo.

1. Labat: Text Book on Regional Anesthesia, ed. 2, Philadelphia, W. B. Saunders Company, 1928.

2. Fowler, R. H., and Todd, T. W.: The Muscular Relations of the Tonsils, Am. J. Anat. **40**:355, 1927; The Muscular Attachments of the Tonsils, J. A. M. A. **90**:1610 (May 19) 1928.

muscular relations of the tonsil. The knowledge that the palatopharyngeus and not the superior constrictor muscle of the pharynx makes the major part of the tonsillar bed is important. This muscle sends numerous strands into the tonsil, forming what these authors called the "tonsillopharyngeus" muscle, which is attached around the lateral surface of the tonsil slightly below its middle.

Fowler and Todd did not complete the study of the nerves that supply the tonsil.

Wayne J. Atwell,[3] by careful dissections of fresh specimens and serial sections taken from the tonsillar region of new-born infants, has found the principal, deep, sensory nerve supply to come from the several trunks of the glossopharyngeal with their several filaments that traverse the tonsillopharyngeal bundle and occasional filaments that enter the tonsil slightly above the bundle. The converging fibers of the tonsillopharyngeus are also the main paths for the arterial supply. Thus the tonsillopharyngeus and accompanying structures serve as a kind of peduncle the point of attachment of which may, with considerable propriety, be called the hilus of the tonsil.

The other main nerve supply of the tonsil region is provided by branches of the posterior palatine nerve, which accompany the tonsillar branches of the descending palatine artery. These branches pierce the palatopharyngeus muscle and, still descending, cross the peritonsillar space to enter the lateral surface of the tonsil above the attachment of the tonsillopharyngeus.

Atwell further stated:

> There is considerable anatomical support for the idea that nerve block of the deep sensory nerves of the tonsil may be accomplished by a single injection introduced through the anterior pillar into the peduncle of the tonsil. This should bring the anesthetic solution into contact with the nerves entering by way of this peduncle and, infiltrating the peritonsillar space, reach the nerves which cross independently of the peduncle.

By introducing methylene blue (methylthionine chloride, U. S. P.) into the anesthetizing solution and injecting the solution through the lower one third of the anterior pillar, skirting the aponeurosis and finally depositing the solution into the midst of the tonsillopharyngeus bundle, it was found that the tissues in the peritonsillar space as well as the bundle were dyed. This would give considerable support to the idea that a single injection of an anesthetizing solution properly placed will secure anesthesia.

VASOCONSTRICTION

Because the blood supply to the tonsil follows the same route as the nerves, it is possible to obtain a vascular block as well as a nerve block.

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3. Atwell, Wayne J.: Personal communication to the author. Professor Atwell is professor of anatomy at the University of Buffalo.

This is accomplished by incorporating 3 drops of epinephrine hydrochloride to 5 cc. of the anesthetic solution and injecting 2.5 cc. into each tonsil. Ten minutes are allowed, and enucleation can be done practically painlessly and bloodlessly.

ANESTHETIC SOLUTION

I have used quinine and urea hydrochloride solution, 1 per cent in strength, 2.5 cc. to each tonsil. Ten minutes are allowed for full anesthesia.

In five hundred cases, nerve block anesthesia with quinine and urea hydrochloride has proved satisfactory. I have not experienced any complications or ill effects from either quinine and urea hydrochloride or epinephrine hydrochloride. The anesthesia at the time of operation is excellent, and the recovery of the patient is much smoother because the anesthesia lasts for several days.[4]

40 West North Street.

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4. Trotter, H. A.: Nerve Block in Amygdalectomy, Ann. Otol., Rhin. & Laryng. **38**:376 (June) 1929; The Function of the Muscular Attachments of the Tonsil, ibid. **38**:825 (Sept.) 1929.

Clinical Notes

MIKULICZ' DISEASE AND SYNDROME*

FRED W. DIXON, M.D., CLEVELAND

In 1888, Mikulicz[1] reported before the Verein für wissenschaftliche Heilkunde a case of bilateral, chronic, painless enlargement of the lacrimal glands with an associated enlargement of the salivary glands in a man 42 years of age. As time passed, this disease came to bear the name of Mikulicz. This disorder, as first described by Mikulicz, consists of a chronic symmetrical enlargement of the lacrimal and salivary glands. The pulse and temperature remain normal. The general health is not impaired. The swelling is hard, painless and noninflammatory. The blood picture remains within normal limits. The remainder of the lymphatic structure is not involved. Mikulicz could discover no cause for this condition, but it was his opinion that it was due to some infection.

Since that time, more than one hundred similar cases have been reported. However, as our knowledge of this disease increased, it soon became evident that not all of the cases reported were true Mikulicz' disease. In many that showed involvement of the lacrimal and salivary glands there was an associated involvement of the lymphatic glands and alterations in the blood picture.

In 1915, Thursfield,[2] feeling that many of the cases reported were not cases of true Mikulicz' disease, divided the pathologic condition into: (1) Mikulicz's disease proper and (2) Mikulicz' syndrome. Under the disease proper, he included cases of involvement of the lacrimal glands and of one or more salivary glands without any ascertainable cause. Under the syndrome, he placed cases in which an associated condition was found in the lymphatic and hematopoietic systems. Whether these conditions are causative or simply coexistent is often difficult to determine.

Later Schaffer and Jacobsen[3] proposed the following classification, which seems to us to be the most rational:

1. Mikulicz' disease
   - (*a*) Familial
   - (*b*) Mikulicz' disease proper
2. Mikulicz' syndrome
   - (*a*) Leukemia
   - (*b*) Tuberculosis
   - (*c*) Syphilis (?)
   - (*d*) Lymphosarcoma
   - (*e*) Toxic
     - Lead
     - Iodides, etc.
   - (*f*) Gout
   - (g) Febris uveoparotidea subchronica

* Submitted for publication, Aug. 24, 1931.

1. Mikulicz, J.: Berl. klin. Wchnschr. **25**:759, 1888.
2. Thursfield, H.: Quart. J. Med. **7**:237, 1914.
3. Schaffer, A., and Jacobsen, A. W.: Mikulicz's Syndrome, Am. J. Dis. Child. **34**:327 (Sept.) 1927.

Regarding the foregoing classification, congenital familial condition is the most rare. Quincke [4] reported cases in a family in which several members were affected. Under the associated conditions of syndrome, that of the leukemias ranks first. In fact, many writers are of the opinion that the syndrome is simply an aleukemic stage of leukemia. As early as 1909, Howard [5] proposed the theory that the disease proper progressed through a pseudoleukemic stage to leukemia. He further concluded that, "a whole series of cases exist forming links in the chain from isolated lymphomata of the lacrimal or salivary glands to complete involvement of these glands with simultaneous disease of the lymphatic and hematopoietic apparatus." Schaffer and Jacobsen,[3] who proposed the foregoing classification, doubted this, and very rationally concluded: "Our feeling then is that though every case of Mikulicz Syndrome is possibly one of leukemia, Mikulicz' Disease proper is not potential leukemia."

The rôle that tuberculosis plays in producing this condition has caused much discussion. Since this syndrome is usually found in a patient with a low grade infection, it seems probable that tuberculosis might easily be causative. The histologic examination of the glands shows a round cell infiltration, small nodules of epithelioid cells and numerous giant cells with much overgrowth of connective tissue. While this description coincides with the microscopic report of a tuberculous condition, neither necrosis nor tubercle bacilli are found. The patient does not react to subcutaneous injections of tuberculin, nor does the introduction of portions of the excised gland into the peritoneal cavity of a guinea-pig cause any ill effect.

After reporting a case, Griffith [6] concluded his summary by stating: "A study of some of the literature as well as the bioscopic examination in my own case supports the conclusion that although tuberculosis may be a cause of Mikulicz' disease, it is rarely so, and that even an histologic appearance in the glands which strongly suggests tuberculosis is not a positive proof that the disease is present."

The influence of syphilis has been much discussed. Most writers question whether syphilis plays any part in the disease. It is for this reason that I wish to report the following case:

E. Y., a colored woman, aged 30, was admitted to the otolaryngologic department of Lakeside Dispensary, Oct. 14, 1930, with cerumen in her ears. Otherwise, the ears, nose and throat were normal. She again came into the dermatological department on Jan. 14, 1931, with a skin eruption; a diagnosis of syphilis was made. At that time and six weeks later, the Wassermann reaction was 4 plus. Treatment was advised, but the patient did not reappear for one month. On Feb. 16, 1931, she again presented herself. There was swelling of the upper part of the eyelids and of both cheeks. One month previously, she had noticed both upper eyelids becoming puffy. One week later, both cheeks began to enlarge. There was no pain or tenderness over the affected part. The throat was dry, and swallowing was difficult. The eyes burned at times. The appetite was good, the bowels regular; she slept well but felt tired most of the time. She had lost 35 pounds (15.9 Kg.) during the previous two months. The patient had had measles and mumps in childhood and typhoid at 16; she had not had any operations or accidents. There was no family history of similar swellings. The patient was married in 1923, and was separated from her husband in 1927. She had one son, aged 7, who was healthy and normal.

4. Quincke: München. med. Wchnschr. **53**:47, 1906.
5. Howard, C. P.: Internat. Clin. **1**:30, 1909.
6. Griffith, J. P. C.: Am. J. M. Sc. **178**:853 (Dec.) 1929.

Physical examination revealed a well developed woman. The outer one third of the eyebrows was scanty; there was alopecia at the temples. The reflexes were sluggish. The lacrimal glands were swollen to the size of a hickory nut; they were firm, hard, sharply defined and freely movable, and were not red or tender. The puffiness of the upper eyelids was overcome by the patient by tilting the head backward so that she could see. The parotid glands were markedly swollen, partially obscuring the ears; they were firm, symmetrical and not tender; they gave the appearance of mumps. The remainder of the lymphatic structure was normal. The liver and the spleen were not palpable.

Examination of the blood showed: a Wassermann reaction of 4 plus; red cells, 4,410,000; white cells, 9,600; differential count: polymorphonuclears, 64 per cent; small mononuclears, 24 per cent; large mononuclears, 6 per cent; transitionals, 2 per cent, and eosinophils, 4 per cent.

Lumbar puncture was made and 8 cc. of spinal fluid was withdrawn; it was colorless. The test for globulin was negative; the cell count gave normal results; the Wassermann test was negative, and the Lange test gave normal results.

At this time antisyphilitic treatments were instituted. During the next two months, the patient received five intravenous injections of arsphenamine supplemented with injections of bismuth salicylate. Three months after the patient was treated for this condition, the swelling in the parotids had disappeared, the right lacrimal gland had become normal; the left remained slightly enlarged to palpation, but not sufficiently to cause disfigurement. Although the condition of the throat was improved, the patient was still annoyed by its dryness. In August, six months after she was first seen, the swelling of the lacrimal and parotid glands had completely subsided. The eyes were declared by the ophthalmologist to be normal. She had gained in weight; the lassitude had disappeared, the throat was moist, and the general condition was excellent. The Wassermann test was negative.

In regard to the Mikulicz syndrome in sarcoma, there are many cases on record in which one or all of the salivary and lymphatic glands were involved.

Finally, in the rather obscure condition described by Heerfordt,[7] which he designated as "febris uveoparotidea subchronica" iridocyclitis is the main symptom, associated with enlargement of the parotid and sometimes the other salivary glands.

The prognosis and treatment in this disease depend on the classification into which the condition in the particular case falls. Many cases of the disease proper progressed to a fatal termination in from one to two years. Thursfield[2] stated "that one to five years releases the patient." Pinch[8] stated: "Of Mikulicz' original case reported in Jan., 1888, he later reported his death in August the same year after a nine day illness. Cause of death was given as perityphilis. During his last illness, the parotids rapidly decreased in size until, at the time of his death, they were almost normal." It is not uncommon to observe the complete disappearance of this glandular enlargement during the presence of some acute infection. Later, when recovery from the acute illness occurs, the enlargement reappears.

The treatment for the syndrome is entirely the treatment for the primary disease. The use of the roentgen rays on these enlarged glands seems to have met with variable results. In Griffith's case, this treatment was entirely without effect. Several cases were reported in which the swelling of the glands promptly subsided but the disease progressed to a fatal termination.

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7. Heerfordt, C. F.: Arch. f. Ophth. **70**:254, 1909.

8. Pinch, A. E. H.: Brit. M. J. **2**:586 (Oct. 2) 1926.

Leucutia and Price,[9] reporting their treatment by irradiation, came to the conclusion that divided doses spread over a longer period are more effective than one single massive dose. Likewise, the penetration and consequently the hardness of the rays are of considerable less importance. In their cases, a dose of from 15 to 50 per cent of a skin unit dose was administered over the affected glands, and the treatment was repeated within from three to eight weeks for two or three series. The quality of the roentgen rays used was from 0.13 to 0.14 angstrom units (with 200,000 volts, with 1 mm. of copper and 1 mm. of aluminum used as filters).

CONCLUSIONS

In presenting this case of Mikulicz' syndrome, I feel that one is justified in classifying it under the much debated head of syphilis. Apparently the antisyphilitic treatment directed at the primary cause effected a cure.

9. Leucutia and Price: Am. J. Roentgenol. **24**:491, 1930.

OSSEOUS CHOANAL OBSTRUCTION AND ADENOID TISSUE*

C. W. Geiger, M.D., and J. H. Roth, M.D., Kankakee, Ill.

Osseous obstruction of the nares has only occasionally been reported. We made such a report with a review of the literature in *Annals of Otology, Rhinology and Laryngology* for September, 1926. While this rather rare anomaly has caused considerable discussion anatomically, practically nothing has been said concerning its effect on the development of adenoid tissue. The findings in a recent case may justify consideration.

REPORT OF A CASE

A girl, 4½ years old, was brought to our attention on account of a persistent obstruction of the left side of the nose. The mother had observed this condition since early infancy. The child had never been able to clear the left side of the nose of mucus. The mother said that it was necessary to remove long ropes of mucus from this side daily. There had been more or less crusting and sometimes excoriation of the left ala. The child was a victim of frequent "head colds," in both summer and winter. The family history was unimportant except that the patient bore a great facial resemblance to the father, whose hearing was impaired by otosclerosis. No serologic or laboratory data were available.

Routine examination was difficult because of the lack of cooperation. The child was of slight physique and considerably underweight. The face was asymmetric, the lower maxilla exceptionally short, the head narrow but long and the nose thin and "pinched." There was considerable cervical adenitis on the right side. The teeth showed evidence of early nutritional disturbances. A fleeting glance was obtained of the tonsils, which, though not obstructive, appeared red. About all that could be seen in the nose under the circumstances was an abundance of glary white mucus in the left nostril. The palate was high and very narrow. The ears were uninteresting on superficial examination. Because of the history and the glary

* Submitted for publication, Oct. 7, 1931.

* Roth, J. H., and Geiger, C. W.: Ann. Otol., Rhin. & Laryng. **35**:849 (Sept.) 1926.

white mucus in the nose, general anesthesia was advised for examination of the nose and operation on the tonsils and adenoids, if authorized.

Under nitrous oxide and ether anesthesia a complete obstruction was found well back in the left choana. This was solid enough and in such a locality as to lead one to assume that it was osseous. As the right side of the nose presented ample assurance of respiratory capabilities, no surgical consideration was given to the obstruction on account of the age and general condition of the patient.

The right tonsil, though not obstructive, appeared sufficiently pathologic to demand operation. The left tonsil was atrophic, and when removed in toto was found to be about the size of a large pea. Similarly there was no adenoid tissue on the side of the obstruction, but an obstructive mass was found on the patent side.

COMMENT

Whether complete nasal obstruction, either unilateral or bilateral, has any effect on the development of adenoid tissue, we do not care to hazard an opinion. However, the findings are of more than passing interest, and osseous obstruction of the choana is rare enough to warrant the addition of a case to the literature.

A NEW OPERATION FOR OZENA*

H. L. Berman, M.D., New Haven, Conn.

It has been thought by many rhinologists that if the normally large space left in the nose as a result of ozena could be diminished a favorable effect could be produced. Any procedure working toward the amelioration of this annoying condition seems worth trying. Paraffin, whole blood, ivory and bone transplants beneath the mucosa have been tried. Operations like the Lautenschager and Halle, in which the lateral wall of the nose has been moved mesially, have been undertaken. The procedure I shall describe has, as far as I know, not been previously suggested. Its first recommendations are its safety and simplicity.

TECHNIC

For unilateral ozena, an incision is made on the opposite side of the septum as would be done in a submucous resection. The mucous membrane is elevated on the good side over the whole cartilaginous area. The cartilage is cut through at the site of the original incision, and the mucous membrane on the affected side is elevated down onto the floor and high up along the crest and back over the ethmoid plate and vomer. The cartilage is then removed in bites by cutting forceps. As these pieces of cartilage are removed, they are placed in warm saline solution. They are removed down to the vomer, leaving only a strip at the upper margin. The pieces of cartilage that have been removed are then reinserted, one, two or three abreast, on the affected side along the vomer, up high along the upper border of the cartilage, or along the ethmoid plate, depending where narrowing is needed most. In packing the nose, a small piece of packing is inserted on the affected side where cartilage only has been removed. This tends to keep the inserted pieces of cartilage from slipping out of position. The other side is then packed in the regular manner. On the affected side a small Bernay splint, trimmed down if necessary, may be employed.

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* Submitted for publication, Nov. 27, 1931.

One requisite of this operation is that the operator does not mutilate the mucous membrane of the septum, particularly on the affected side. If one can do a submucous resection of the septum well, this operation will not be difficult.

For bilateral ozena, the mucous membrane is elevated widely on both sides. Where there is not enough cartilage for insertion on both sides, it is recommended that the cartilage be inserted crosswise, first squaring off the ends of the pieces that have been removed. It may be necessary to tie two or three pieces together with catgut. No packing should then be employed. The original incision should be sutured. If a troublesome hematoma develops, it can be dealt with later.

It may also be necessary to utilize part of the ridge of the vomer if the cartilage removed is not sufficient.

I have carried out this operation on one patient. The result was favorable.

1142 Chapel Street.

MASTOID RASP*

GEORGE D. WOLF, M.D., NEW YORK

The rasp is not a new principle in bone surgery, and its function need not be further expounded here. In numerous operations on the mastoid I have frequently had occasion to use a proper type of rasp, but up to now I have not been able to find the correct instrument.

The mastoid rasp.

The rasp, here pictured, adds another useful instrument to the mastoid armamentarium, and it is not expected to supplant either the Sprat or the Richard curet. It has certain advantages that are lacking in the curet:

1. It is of stronger construction, and is less likely to break during the course of an operation.

2. It has five sharp teeth, and hence requires less effort in its employment.

3. For a similar reason it will retain its sharpness for a greater length of time.

4. It is the instrument of choice in smoothing rough edges in either operations on the mastoid or radical operations on the external part of the nose.

The rasp consists of a series of undercut teeth with sharp, scraping edges, and is made of a high speed carbon tool steel, properly hardened for scraping bone. The peculiar profile of the teeth makes it effective, and the metal handle is of the design that has been found best suited for instruments of this nature.

The manufacturers of this instrument are George Tiemann and Company, 107 East Twenty-Eighth Street, New York.

1075 Park Avenue.

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* Submitted for publication, Dec. 7, 1931.

* From the Oto-Laryngological Service of Sydenham Hospital.

EPHEDRINE SULPHATE: ITS USE IN OTITIS MEDIA*

ROY F. NELSON, M.D., OAKLAND, CALIF.

Ephedrine salts have proved their usefulness and safety as agents to reduce acute inflammatory reactions of respiratory mucosae and thereby promote drainage from infected spaces.

In many cases of acute and subacute suppurative otitis media marked inflammatory thickening of the membranes is seen, and it often seems that such swelling in so small a cavity must make drainage difficult, especially when the discharge is thick and tenacious.

It therefore occurred to me that ephedrine sulphate might reduce this turgescence, facilitate drainage, promote recovery and help to prevent surgical mastoiditis. I have used it alone in 3 per cent aqueous solution and as a 3 to 5 per cent addition to 70 per cent alcohol and several of the newer antiseptic agents, after the canal has been cleansed with fine suction tubes, irrigations or wicks. From ten to fifteen minutes after its use, I have observed definite blanching and some shrinkage of very thick, boggy tympanic membranes and the evacuation of more pus than would otherwise escape in that length of time. Some cases that appeared to be definitely heading toward a mastoid operation or chronic otitis media seemed to turn the corner to recovery under this treatment. Fifteen minutes after instillation of the ephedrine sulphate drops, suction cleansing by means of a flexible silver lacrimal cannula, passed under direct visual control just to the perforation, gives particularly good evacuation of a middle ear distended with viscous mucopus.

411 Thirtieth Street.

* Submitted for publication, Dec. 4, 1931.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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PERORAL ENDOSCOPY

LOUIS H. CLERF, M.D.
PHILADELPHIA

Every year it has been observed that there has been an increase in the number of contributions to the literature of peroral endoscopy. Whereas formerly reports of cases of foreign body came from relatively few bronchoscopic clinics, now reports are observed in practically every state medical journal. This is indicative of a more general recognition of these cases as well as an increase in the number of specialists who can successfully care for them. Bronchoscopy and esophagoscopy are now commonly accepted procedures in diagnosis and treatment. The literature dealing with these procedures, consisting in great part of reports on their use and the results secured, is becoming voluminous. Since many of these articles set forth views that have been generally accepted, it would seem an unnecessary repetition to include them in this review.

DISEASES OF THE ESOPHAGUS

Congenital Stenosis.—In considering congenital stenosis of the esophagus, attention has always been focused on the narrowing of the esophageal lumen, and no opinion has been expressed regarding the character of the esophagus distal to the stenosis. In an interesting and careful study of this phase of the subject, Findlay and Kelly [1] reported 9 cases of congenital constriction of the esophagus. In these it was found that the junction of the esophagus and stomach was situated close to the lower end of the stenosis above the hiatal level, and that the part beyond the narrowing presented the usual appearance of gastric mucosa. From the symptomatology and the dilated tube, as shown roentgenologically, it was believed that the condition was a diaphragmatic hernia of the stomach.

By careful roentgen studies in 9 cases and by esophagoscopy in 8 of these, it was conclusively shown that the tube extending between the

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1. Findlay, L., and Kelly, A. B.: Congenital Shortening of the Oesophagus and the Thoracic Stomach Resulting Therefrom, J. Laryng. & Otol. **46**:797 (Dec.) 1931.

stenosis and the diaphragm was greatly dilated and was lined by gastric mucosa. In 7 cases the stenosis shown on the roentgenogram was revealed to be on a level with some part of the seventh thoracic vertebra; in the other 2 cases it was opposite the fifth and ninth thoracic vertebrae, respectively. From an esophagoscopic standpoint two varieties of congenital stenosis were met with. In one there was found a thin annular membrane or diaphragm with a small perforation or a fold projecting from more or less of the circumference. In the other there was a gradual and uniform reduction of the lumen of the esophagus for a distance averaging 1 cm. On emerging from the stenosis the end of the esophagoscope either came directly in contact with gastric mucosa or entered a space lined with this. Although the authors had no difficulty in recognizing the junction of the esophageal and gastric mucous membranes from the appearance and color, they corroborated this by securing the chemical reaction of the secretions and removing small pieces of mucosa from below the gastro-esophageal junction for microscopic examination. In each instance gastric mucosa was found. They believed that the dilated portion of the food passage beyond the narrowing was part of the stomach and that the height in the thorax to which the stomach reached above the hiatus esophagus corresponded approximately to the amount of congenital shortening of the esophagus.

Papilloma of the Esophagus.—Additions to the scant literature on benign tumors of the esophagus have been made during the past year. In this connection it is important to note that without direct visual inspection an accurate diagnosis would have been impossible during life.

Papilloma of the esophagus occurring in a child, aged 3 years, was reported by McKinney.[2] There was progressive dysphagia of brief duration, with no history of ingestion of a caustic. Esophagoscopic bouginage was done, and at a subsequent examination a budding tumor was removed which proved by histologic examination to be papilloma. Esophagoscopic removal of the growth with additional bouginage resulted in a cure.

A case of multiple papillomas involving a considerable portion of the esophagus, in a man aged 63, was reported by Ginsburg.[3] When the case was first seen by him an inferential diagnosis of cancer of the esophagus had already been made, esophagoscopy had been advised against and bouginage recommended. By esophagoscopy Ginsburg found extensive involvement of the esophagus, and the appearances were suggestive of cancer. Tissue removed for biopsy was reported as showing papilloma. A complete cure was obtained after several

2. McKinney, R.: Papilloma of the Lower End of the Esophagus in a Child, Ann. Otol., Rhin. & Laryng. **40**:918 (Sept.) 1931.

3. Ginsburg, L.: Multiple Papillomas of the Esophagus, Arch. Otolaryng. **14**:570 (Nov.) 1931.

removals. The case is of interest because of the error in diagnosis and the importance of esophagoscopy in determining the cause of dysphagia.

Sarcoma of the Esophagus.—Dvorak's [4] paper is of particular interest to esophagoscopists as it presents a comprehensive review of esophageal sarcoma. Dvorak reported a case of sarcoma occurring in a woman, aged 27. The early symptoms suggested ulcer of the stomach, and she had received treatment for this over a period of several years. Dysphagia did not develop until about three years after the onset of the symptoms of ulcer. An esophagoscopy was performed. Tissue was removed from a necrotic tumor mass located about 20 cm. from the incisor teeth. A diagnosis of sarcoma was made, gastrostomy was performed and radium therapy was instituted, but the patient ultimately died. Dvorak found that about 30 unquestioned cases of sarcoma of the esophagus had been reported. Sarcoma occurs more frequently in the young than cancer and is observed more often in the lower third of the esophagus. Dysphagia is usually not the earliest symptom. Marked emaciation may develop long befo e there is appreciable stenosis. Pain is often early and severe. Sarcoma of the cervical esophagus has been successfully resected. Early correct diagnosis is important, and this can be made positive only by biopsy.

Cancer of the Esophagus.—In a symposium on the diagnosis and treatment of cancer of the esophagus, Ernst [5] discussed the general problems involved in the roentgen study of these cases, and pointed out that roentgen examination of the extreme upper part of the esophagus is not very satisfactory, and therefore too much importance cannot be attached to a negative report. In the thoracic esophagus it is necessary to exclude disease of surrounding structures. Spinal deformity may give confusing findings; in these cases it is well to remember the possibility of a localized thoracic abscess arising from a tuberculous spondylitis. Every routine examination must be complete and should include an intensive and careful fluoroscopic study of the act of swallowing with various types of opaque mediums. In the treatment for esophageal cancer, Ernst believed that deep roentgenotherapy was probably preferable and should precede the application of radium to the local lesion if these methods were both used.

In discussing the esophagoscopic aspects of esophageal cancer, Jackson [6] emphasized the importance of esophagoscopy as a diagnostic means and its preference to methods of inferential diagnosis by the

4. Dvorak, H. J.: Sarcoma of the Esophagus, Arch. Surg. **22**:794 (May) 1931.

5. Ernst, E. C.: Cancer of the Esophagus: Roentgenologic Aspects, Ann. Otol., Rhin. & Laryng. **40**:870 (Sept.) 1931.

6. Jackson, C.: Cancer of the Esophagus, Esophagoscopic Aspects, Ann. Otol., Rhin. & Laryng. **40**:886 (Sept.) 1931.

bougie or the history of the case. The esophagoscopic appearances of cancer were presented. Palliative measures, including dilation, intubation and gastrostomy, were considered. Jackson concluded that most patients with cancer of the esophagus are treated under an erroneous diagnosis of "spasm" until the growth is far advanced. Esophagoscopy is the only means of making with certainty a very early diagnosis of cancer of the esophagus. Roentgen study is a valuable means of diagnosis of malignant disease of the esophagus. Neither esophagoscopy nor roentgen study should be omitted in any case of the slightest abnormality in swallowing; both are essential for diagnosis. A diagnosis of spasm of the esophagus should never be regarded as more than tentative until an organic lesion has been ruled out by esophagoscopy. Esophagectomy has never had a fair trial because the esophagoscopist and the roentgenologist rarely have an opportunity to make an early diagnosis. The surgeon should be encouraged in his efforts to perfect the technic of operation and also that of external implantation of radons in cancer of the esophagus, cervical, thoracic and abdominal. Deep roentgen therapy is the most efficient of the palliative measures directed against the growth itself, but only when instituted early and combined with proper medical care and management, especially dietary management. It is a mistake to irradiate a patient far advanced in emaciation and cachexia. An increase of toxemia will shorten his life. Radium and radon, in Jackson's hands, have been on the whole less effective than deep roentgenotherapy, but their use is advisable in some cases. Earliness in commencing palliative treatment is as essential as in any attempt at cure. The difference in prolongation of life between palliative measures begun very early and those instituted late usually amounts to many months, sometimes years. Gastrostomy, intubation and esophagoscopic dilation have advantages and disadvantages, but each procedure requires early performance to yield satisfactory results. This requires early diagnosis, which is rarely made for lack of early esophagoscopy.

The chief difficulties with the surgical treatment for cancer of the esophagus, according to Graham and Ballon,[7] are the relative inaccessibility of the growth and the fact that in most patients who present themselves the disease is advanced and they are suffering from inanition and cachexia. The methods of surgical approach for cancer of the cervical and thoracic portions of the esophagus were discussed. The authors believed it possible that carcinoma of the esophagus would be better treated if radon seeds were inserted into the periphery of the growth in addition to the intraluminal use of radium, since both direct surgical attack and roentgenotherapy alone have been unsatisfactory

7. Graham, E. A., and Ballon, H. C.: Cancer of the Esophagus: Surgical Aspects, Ann. Otol., Rhin. & Laryng. **40**:895 (Sept.) 1931.

except for a few dramatic results. Exposure of the tumor, even in the thoracic portion, for the application of radon seeds is not a difficult or a hazardous procedure.

Stricture of the Esophagus.—The ingestion of caustic alkalis is unquestionably the most common cause of cicatricial stenosis of the esophagus. Occasionally a case of stricture is observed in which no etiologic factor can be elicited. Imperatori [8] reported the case of a man, aged 25, in whom difficulty in swallowing developed immediately after an appendectomy; in fact, it was noticed on his recovery from the anesthetic. The condition became progressively worse, and when the patient was examined by Imperatori six months after the onset he was unable to swallow anything. At esophagoscopy complete obliteration of the esophageal lumen at its lower end was found. No ulceration was noted. The walls of the esophagus appeared to be glued together. It was decided to perform a gastrostomy and at the same time to attempt penetration of the cicatricial esophageal barrier so that a string might be placed for subsequent retrograde dilation. With an esophagoscope passed down to the atresic point from above, the surgeon inserted his index finger into the cardiac end of the esophagus through the opened stomach. He was able to feel the tip of the esophagoscope. With the finger tip at the end of the esophagoscope a bougie was then passed through the esophagoscope from above, pushed through the barrier and recovered. A string was attached to its end and it was withdrawn. Retrograde dilation was carried out, and the patient made an uneventful recovery.

In discussing the treatment for strictures of the esophagus, Tucker [9] emphasized the importance of roentgen study of the esophagus and esophagoscopic examination in diagnosis. He considered esophagoscopic bouginage safe in trained hands, and indicated that it should be used in those cases in which gastrostomy is unnecessary. In addition, local medication should be applied at the time of bouginage if ulceration is present. Rapid instrumental dilation is dangerous. Although gastrostomy may at first seem to be an additional hazard, it permits of adequate feeding, allows the esophagus to be placed at rest and permits the performance of retrograde bouginage, the safest of all methods of treatment.

Pemphigus of the Esophagus.—Stricture of the esophagus at the cricopharyngeal level in a man who had pemphigus was reported by Imperatori.[10] The pemphigus involved the mouth, pharynx and face

8. Imperatori, C. J.: Complete Atresia of the Esophagus, Ann. Otol., Rhin. & Laryng. **40**:1194 (Dec.) 1931.

9. Tucker, G.: Strictures of the Esophagus: Diagnosis and Treatment, Laryngoscope **41**:426 (June) 1931.

10. Imperatori, C. J.: Stricture of the Esophagus Caused by Pemphigus, Ann. Otol., Rhin. & Laryng. **40**:1192 (Dec.) 1931.

and had lasted for thirteen years. The dysphagia was of ten months' duration. At esophagoscopy, the stenosed area appeared to have cobwebs scattered over it and the stricture seemed to be superficial. A complete recovery followed esophagoscopic bouginage.

Dysphagia Complicating Adenomatous Goiter.—Compression of the esophagus and trachea has been observed as a complication of adenoma of the thyroid gland. The two types of compression are usually associated, and the etiology is then apparent. In Moersch's [11] case there was no evidence of interference with the airway. The patient, a woman aged 40, had dysphagia over a period of ten years. The obstruction was described as being in the "throat," and usually could be relieved by a twist of the head, by massaging the throat or with the aid of a spoon. Roentgenograms indicated the presence of a high esophageal obstruction, apparently resulting from an extrinsic tumor. A firm adenoma in each lobe of the thyroid gland was also noted. At esophagoscopic examination a compression stenosis was found, with displacement of the esophagus to the right by an extrinsic mass. Immediately below this the esophagus was displaced to the left by a mass on the right side. The esophageal lumen presented a sharply angulated S course. This corresponded to two calcified adenomas, which were revealed by roentgen examination. Following thyroidectomy the esophageal lumen appeared normal although slight dysphagia persisted, but this ultimately cleared up.

An unusual case of dysphagia suggesting esophageal foreign body was reported by Chamberlin.[12] The patient, a child, became hoarse and was unable to swallow. There was no roentgen evidence of an opaque foreign body, but the bismuth meal did not go beyond the sixth cervical vertebra. There was no history of foreign body. Laryngoscopy and esophagoscopy were performed, with negative results. Six days later otitis media developed, requiring paracentesis, and ten days after this a mastoidectomy was necessary. Inability to swallow persisted, and tube feeding was continued for six weeks although the aural condition cleared promptly. The interesting question in this case was whether the dysphagia was of a functional nature or due to a paralysis of toxic origin.

FOREIGN BODIES IN THE ESOPHAGUS AND AIR PASSAGES

In commenting on a series of cases of foreign bodies, Equen [13] emphasized the view held by esophagoscopists that there is no other

11. Moersch, H. J.: Tracheal and Esophageal Compression as a Result of Adenomatous Goitre, Ann. Otol., Rhin. & Laryng. **40**:909 (Sept.) 1931.

12. Chamberlin, W. B.: Dysphagia of Septic Origin Resembling Foreign Body in the Esophagus, Laryngoscope **41**:36 (Jan.) 1931.

13. Equen, M.: Foreign Bodies in the Food and Air Passages, South. M. J. **24**:757 (Sept.) 1931.

form of treatment for foreign bodies except prompt and careful removal by endoscopic means. Attempts at digital removal, slapping the patient on the back or swinging him by the feet usually afforded no relief and often proved to be extremely hazardous.

Brown [14] cited the case of a boy, aged 3 years, who at the age of 3 months swallowed a small metal ring. Although there were signs of malnutrition, intermittent attacks of coughing and, later, dysphagia for soft foods, a roentgen study was not made until three years later. On esophagoscopy the ring was found in the esophagus at the level of the suprasternal notch, partially embedded in inflammatory mucous membrane. Following removal, recovery was uneventful.

In discussing the question of esophagoscopic intervention in cases of acute suppurative mediastinitis, Orton [15] presented an additional case that he had seen in consultation after two esophagoscopic examinations were made to remove a bottle cap. The patient's condition was critical, and he died the following day. Autopsy revealed a perforation of the esophageal wall with a periesophageal abscess. Orton concluded that mediastinotomy is indicated in cases of perforation of the upper part of the esophagus.

In reporting on a series of cases of foreign body in the air and food passages, Gittins [16] again emphasized the importance of foreign bodies in a consideration of obscure conditions of the chest. In many of his cases, attention to the history or a roentgen study would have been sufficient to clear up the diagnosis. In summarizing his findings, he agreed that emergency work is seldom necessary, that careful study of the type and location of the foreign body are of the utmost importance as the first measure in treatment. Previous roentgen studies should be carefully checked immediately preceding any endoscopic procedures because of the tendency for foreign bodies to change their position. The importance of a proper instrumentarium in working order, preliminary practice with a duplicate foreign body and teamwork are discussed. In his experience the reaction of the tracheal and bronchial mucosa has been more marked to kernels of corn than to peanuts. He attributed this to the fact that the corn, being loose in the trachea, produced additional trauma during paroxysms of coughing.

In discussing a series of cases of foreign body selected to illustrate the importance of giving proper consideration to this condition when a

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14. Brown, A. L.: Foreign Body in the Esophagus for Three Years, California & West. Med. **34**:372 (May) 1931.

15. Orton, H. B.: Presidential Address, Proc. Am. Bronch. Soc., 1931.

16. Gittins, T. R.: Foreign Bodies in the Air and Food Passages: Observations in Eighty-One Cases with Special Reference to Overlooked Foreign Bodies, Ann. Otol., Rhin. & Laryng. **40**:183 (March) 1931.

diagnosis is being sought, Richards [17] stressed the responsibility of the family physician, who usually is the first to be consulted by these patients. Often a history of aspiration or choking is available, but can be obtained only by questioning the parents, who may not consider their suspicions of sufficient importance to mention them. Unless the physician has the possibility of foreign body in mind, he may fail to question his informants and may lose a valuable clue. In the absence of a history, foreign body must still be regarded as a possibility to be ruled out by roentgen study and, in certain cases, by bronchoscopy. Often symptoms suggesting foreign bodies prove to be due to chronic bronchitis or dietary imbalances; if, however, foreign body is kept in mind as a possibility, a brilliant diagnosis may be made and a life saved.

In presenting the diagnostic points in bronchial foreign bodies, McCrae [18] again directed attention to the importance of the initial symptoms of choking, coughing and gagging. In the interpretation of the physical signs an erroneous diagnosis of pneumonia is often made. McCrae stated that he never observed a case of pneumonia due to a foreign body in a bronchus, and he believed that if such an error was made, a careful observation of the patient for a few days would correct it. The diagnosis of empyema is another frequent error, probably often born of a previous erroneous diagnosis of pneumonia when the signs do not disappear after a proper interval. In cases of complete blocking of a bronchus with the production of the so-called "drowned lung," there may be more excuse for the mistake; but here, too, a careful study should prevent it.

In a series of 50 cases of vegetal foreign bodies reported by Stiles,[19] it is interesting to note that 38 of the patients were less than 4 years of age. In all of the cases a positive or suggestive history of foreign body was elicited. In some cases this was secured after questioning, and in several instances the accident was not recalled until the foreign body was removed. Stiles agreed that all vegetable foreign bodies induce more local and systemic reaction than do those of an inorganic nature. When other factors are identical, the toxemia caused by the peanut seems to be the most severe. Foreign bodies that remain loose and movable in the trachea cause more violent symptoms and frequently are more dangerous than those which become fixed in a bronchus. They often cause severe subglottic edema, and always present some risk

17. Richards, L.: Forgotten Foreign Bodies, New England J. Med. **204**:1344 (June 25) 1931.

18. McCrae, T.: The Diagnosis of a Foreign Body in a Bronchus, Internat. Clin. **3**:14 (Sept.) 1931.

19. Stiles, M. P.: Vegetable Foreign Bodies in the Trachea and Bronchi: Observations on a Series of Fifty Cases, Ann. Otol., Rhin. & Laryng. **40**:577 (June) 1931.

of sudden asphyxiation. The aspiration of vegetable foreign bodies is a relatively common accident, especially in childhood, and the resulting condition is a serious menace to life. A history of coughing, gagging and choking is suggestive, but regardless of the history the possibility of aspiration of a foreign body should be given full consideration in the examination of children whose symptoms suggest a lesion of the lower respiratory tract. The asthmatoid wheeze, heard at the mouth instead of over the wall of the chest, and the typical signs of obstructive emphysema are so nearly pathognomonic of an endobronchial foreign body that the unexplained presence of either justifies the performance of a diagnostic bronchoscopy. The belief is all too prevalent, especially among the laity, that spontaneous expulsion of a foreign body will occur. That fortunate termination occurs so rarely, and early removal is of such great importance, that its possibility should be ignored.

In a report of cases of foreign body, Elliott [20] cited the history of a child, aged 9 years, who had swallowed a piece of rubber. There was a persistent, purposeless cough with no definite signs in the chest. Roentgen studies gave negative results. In time the patient stated that she could taste rubber. The symptoms persisted off and on for seven years, and many plans of treatment were carried out with no relief. A diagnostic bronchoscopy was finally performed, and a piece of rubber was found in a subdivision of the left bronchus. This was removed, and recovery of the patient was prompt and complete.

In a general discussion of the problems of foreign body, Faulkner [21] agreed with other bronchoscopists concerning the importance of the history in aspiration of a foreign body. In the presence of a history suggestive of foreign body, although the roentgen appearance may be normal, a diagnostic bronchoscopy should be considered.

In a case reported by Daily and Dickson,[22] a paper clip was clearly shown in the right bronchus by roentgen examination. At bronchoscopy, however, a black object that appeared to block the bronchus completely was met with. It was removed and proved to be a wooden bead that had been "swallowed" three months previously. The bronchoscope was reinserted and the paper clip was removed. On close questioning, it was recalled that the child had played with a paper clip six months before. The clip produced no obstruction or local reaction, and consequently no symptoms developed. When the bead was aspirated, complete bronchial obstruction did not occur as there was a hole in its

20. Elliott, M. E. H.: Foreign Bodies in the Bronchi, M. J. Australia **2**:52 (July 11) 1931.

21. Faulkner, W. B., and Faulkner, E. D.: Foreign Bodies in the Air Passages, California & West. Med. **35**:12 (July) 1931.

22. Daily, L., and Dickson, J. C.: An Unusual Case of Two Foreign Bodies in the Lung, Arch. Otolaryng. **13**:283 (Feb.) 1931.

center, 3 mm. in diameter. Symptoms suggesting bronchitis developed and a partially correct diagnosis was made by roentgen study.

LARYNGOSCOPY

Enlargement of the thymus has frequently been considered the cause of chronic stridor, chronic hoarseness, attacks of cyanosis or choking and wheezing respiration in infancy and childhood. That this conclusion is sometimes erroneous and that a correct diagnosis can be arrived at has been shown by Kennedy and New,[23] who selected for study a group of cases presenting the aforementioned symptoms. They agreed that the diagnosis of enlarged thymus is frequently made in cases in which further examination has disclosed other conditions as the cause of symptoms. Stridor, dyspnea, hoarseness, spells of cyanosis and wheezy and noisy respiration can usually be accounted for on other bases than that of enlarged thymus. Laryngoscopic examination is frequently essential for definite diagnosis. Enlargement of the thymus can seldom, if ever, be established as a cause of death. Preoperative examination and care of infants and children should be directed toward finding and correcting all conditions affecting surgical risk. Unwarranted publicity has been accorded the assumption that enlargement of the thymus accounts for much morbidity and mortality in infancy and childhood. In the authors' experience, it has been unnecessary to carry out preoperative irradiation of the thymus.

BRONCHOSCOPY

Bronchoscopy in Diagnosis.—Looper [24] expressed the belief of bronchoscopists generally that the practical use of bronchoscopy as an aid to the diagnosis and treatment of diseases of the chest is increasing in favor. In many cases a final diagnosis can be made only through the help of endoscopy after all other means of investigation have failed. A well equipped central clinic unquestionably affords the best opportunity for the study of such cases, but for various reasons many deserving patients never reach such a clinic. It is apparent, therefore, that the bronchoscopist has a fertile field for investigation in hospitals for the treatment of patients with pulmonary diseases. Looper expressed the hope that the time will soon come when the management of all hospitals for the treatment of patients with tuberculosis will insist on the establishment of a bronchoscopic clinic as an important department.

In a series of cases reported by Kessel [25] hemorrhage was the outstanding symptom. No serious organic disease could be demonstrated.

23. Kennedy, R. L. J., and New, G. B.: Chronic Stridor in Childhood, J. A. M. A. **96**:1286 (April 18) 1931.

24. Looper, E. A.: Bronchoscopy as an Aid in the Diagnosis of Obscure Pulmonary Disorders, J. A. M. A. **97**:1287 (Oct. 31) 1931.

25. Kessel, L.: Bleeding of Benign Origin, J. A. M. A. **97**:1058 (Oct. 10) 1931.

Thorough investigation, including endoscopic procedures in certain cases, corroborated the tentatively advanced diagnosis that the bleeding was of benign origin. Kessel agreed, however, that the diagnosis of benign bleeding should never be hazarded until all available types of examination have excluded the presence of a blood dyscrasia, malignant neoplasm or chronic inflammatory process, such as tuberculosis. It is unwise, furthermore, to advance this diagnosis unless the benign lesion can be visualized by some direct method of examination, such as bronchoscopy. Indeed, even in cases in which a malignant process has been excluded and a benign process demonstrated, the cautious diagnostician will proceed with the knowledge that the patient with a benign cause for bleeding may harbor a malignant disease as well.

Buckman's [26] assertion that every general hospital should have one or more members of its staff trained in bronchoscopy and esophagoscopy was based on the replies to a questionnaire sent to 118 general hospitals and on his personal experiences. He does not agree that "scarcity of cases" can be accepted as a reason for a lack of proper facilities. He discussed the development of the work and the education of the hospital staff with respect to the need for endoscopic investigations. He concluded that it was the duty of every general hospital to give the surrounding community the benefit of this service, and stated that it should be incumbent on every endoscopist to interest other practitioners in the possibility of aid in this regard.

Bronchoscopy in Tracheobronchial Diphtheria.—In a case reported by Hart and Peeler [27] there was a history of foreign body. The wheezing and asthmatic type of breathing were highly suggestive. A roentgen study gave negative results for foreign body. In spite of these observations the authors believed that a diagnostic bronchoscopy was indicated. The larynx and trachea were found to be normal. Both main bronchi were filled with a quantity of fatlike material; the mucous membrane was edematous. No foreign body was found. In twelve hours respirations became more difficult, there was cyanosis and the dyspnea was expiratory. A tracheotomy was performed to aid in the aspiration of secretion. The secretions removed from the bronchi were found to contain diphtheria bacilli. Later events proved that there was a complete cast of membrane in the right bronchus, which produced complete obstruction; a partial cast was found in the left bronchus. The rare occurrence of diphtheria limited to the bronchi and the history of foreign body were in part responsible for the delay in diagnosis

26. Buckman, L. T.: Peroral Endoscopy in a General Hospital, Pennsylvania M. J. **34**:616 (June) 1931.

27. Hart, V. K., and Peeler, C. N.: Primary Tracheobronchial Diphtheria, Arch. Otolaryng. **13**:714 (May) 1931.

and also emphasized the importance of prompt bronchoscopy in obscure cases of this type and bacteriologic study of bronchoscopically removed secretion.

Bronchoscopy in Tuberculosis.—In Stone's [28] case there was definite bronchial obstruction produced by a mass of granulation tissue. There was no history of foreign body, however; wheezing was present, and obstructive emphysema involved the entire right lung. Although the tissue removed did not show any evidence of tuberculosis, strongly positive tuberculin tests and the subsequent development of an area in the upper right lung, probably a tuberculous infiltration, definitely suggested that the endobronchial lesion was secondary to tuberculous infection of a nearby lymph node.

In discussing the problem of bronchoscopy in tuberculosis, I [29] considered my cases in two groups; namely, proved cases of pulmonary tuberculosis in which certain symptoms or signs developed, requiring investigation or treatment, and cases that presented obscure pulmonary signs suggesting tuberculosis, but in which the diagnosis could not be established by the ordinary methods of examination, or unsuspected cases of tuberculosis that were diagnosed in the course of a routine bronchoscopic study. Bronchoscopic examination was performed in tuberculous patients in whom unexplainable signs and symptoms had developed, and though the cause of these could not always be relieved, positive data were secured which aided in intelligent treatment for the condition. Patients with obscure signs and symptoms in the chest were examined bronchoscopically to determine whether tuberculosis was present; in others the condition was correctly diagnosed although its presence had been unsuspected. I believe that absolute contraindications to bronchoscopy in pulmonary tuberculosis are rare. Pneumothorax, marked hemoptysis, extensive pulmonary involvement and laryngeal involvement can be considered as contraindications. In determining whether bronchoscopy is contraindicated, one must consider the importance of the indications. In a large group of tuberculous patients who were examined bronchoscopically, no ill effects were noted from the bronchoscopy itself. In conclusion, I stated that bronchoscopy is rarely indicated in uncomplicated pulmonary tuberculosis. The chief value of bronchoscopy in tuberculosis is its aid in the diagnosis of unexplainable signs and symptoms. Diagnostic bronchoscopy is indicated in cases presenting obscure pulmonary conditions in which tuberculosis may be suspected, but cannot be proved. Absolute

28. Stone, J. B.: Bronchial Obstruction from Intrabronchial Granulations in a Child Two Years Old, South. M. J. **24**:350 (April) 1931.

29. Clerf, L. H.: Is Bronchoscopy Indicated in Tuberculosis? J. A. M. A. **97**:87 (July 11) 1931.

contraindications to bronchoscopy are few; in questionable cases the indications must be carefully considered.

Bronchoscopy in Asthma.—Although a commonly observed symptom in patients with asthma, wheezing is also frequently met with in other conditions. Jackson [30] discussed the production of wheezing respiration and considered a number of the diseases in which it occurs. In all of these there is a narrowing of the lumen of the airway. It is important to remember that a wheeze may be produced by secretion, as in pulmonary abscess or bronchiectasis. The sound may be heard on inspiration, on expiration or on both. The wheezing may be described as rattling, bubbling, crowing, harsh, whistling, vibratory, stridorous or merely noisy. Jackson concluded that all is not asthma that wheezes. If a patient presents a wheeze, there is always some obstruction in the larger air passages. Most often a foreign body is the cause of the obstruction; next in frequency is a secretion difficult of expulsion by coughing. Obstruction in the smaller bronchi does not cause wheezing that is audible at the open mouth. Bronchoscopic examination practically always reveals the mechanical cause of wheezing. Cooperation of the pediatrician, who can tap, look and listen on the outside, the roentgenologist, who can look through, and the bronchoesophagoscopist, who can look inside the patient, usually solves all diagnostic problems in which pulmonary symptoms are concerned.

In order to ascertain the mechanism by which bronchoscopy gave relief in certain cases of asthma and, if possible, to classify this group, Weille [31] carried out a series of studies in a group of 15 patients. These patients were examined and treated bronchoscopically and all of them have been subsequently observed for periods varying from six months to two years. The report deals with the findings at the time of examination and the character of the secretion found; an attempt had been made to correlate the clinical progress of the patients with any changes noted through the bronchoscope. The term "exudative" asthma was used to designate those cases in which the condition associated with the finding of thick, tenacious secretion adherent to the bronchial walls. The author concluded that insufficient attention has been paid to this condition and its relief by means of bronchoscopy. Seventy-three per cent of the patients whose cases were reported in the present study had been benefited. In the patients experiencing relief, inspissated, sticky secretion clinging to the bronchial mucous

30. Jackson, C.: Wheezing Respiration in Children: Bronchoscopic Observations on Stridorous and Asthmatoid Breathing, Am. J. Dis. Child. **41**:153 (Jan.) 1931.

31. Weille, F. L.: Studies in Asthma: Bronchoscopy in Asthma, New England J. Med. **205**:848 (Oct. 29) 1931.

membrane was the most interesting pathologic finding. The bacteria isolated from the tracheobronchial tree were probably secondary invaders. The cilia appeared to be normal anatomically and physiologically. The mechanism through which the patients described obtained relief is probably mechanical. Cocainization of the mucous membrane, trauma, medullary reflexes, mechanical stretching of the bronchi, etc., may be less important factors. Bronchiectasis in asthma may be an end-stage of "exudative" asthma. The present study suggests that bronchiectatic changes may be prevented by the use of bronchoscopic therapy.

Pulmonary Atelectasis.—Tucker [32] discussed the mechanism of the development of pulmonary atelectasis, and reported cases of bronchial obstruction with atelectasis due to benign and malignant neoplasms, to asthma and to a stricture of the bronchus. He concluded that pulmonary disease may cause bronchial obstruction comparable in mechanism, physical signs and roentgen manifestations to the obstruction produced by aspirated foreign body. When obstructive pulmonary atelectasis occurs, it means that complete occlusion of the bronchus tributary to the atelectatic area has occurred. Obstructive pulmonary atelectasis is an indication for diagnostic bronchoscopy and, in many cases, an indication for bronchoscopic intervention for treatment as well.

Being unable to secure atelectasis of the lung in a series of ten dogs after introducing various forms of plugs in the customary manner to produce complete bronchial obstruction, Van Allen and Lindskog [33] found that resistance to the expired air was necessary before collapse occurred. This is essentially similar to the effect produced by coughing, moaning or grunting, and they referred to it as straining expiration. Continuing their investigations they found that atelectasis failed to occur when only a few of the bronchi of a lobe were plugged, whereas collapse was invariably noted when the plug involved one or more lobes. This was attributed to the rather free communication that exists between the component units of a lobe of a lung.

In a more recent communication [34] the question of intercommunication of bronchial branches and collateral respiration was further investigated. The authors concluded that the branches of the bronchial tree in a single lobe of the lung intercommunicate at the periphery in such manner as to permit the transfer of gases, fluids and particulate matter from one to another. The process of transfer is referable both

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32. Tucker, G.: Bronchoscopic Observations on Obstructive Pulmonary Atelectasis, Arch. Otolaryng. **13**:315 (March) 1931.

33. Van Allen, C. M., and Lindskog, G. E.: Obstructive Pulmonary Atelectasis, Arch. Surg. **21**:1195 (Dec.) 1930.

34. Van Allen, C. M., and Lindskog, G. E.: Collateral Respiration in the Lung: Rôle in Bronchial Obstruction to Prevent Atelectasis and to Restore Patency, Surg., Gynec. & Obst. **53**:16 (July) 1931.

to diffusion and to passage through minute openings, but this point requires further investigation. The airways of two adjacent lobes do not so communicate. This bears economic significance for respiratory function after bronchial obstruction, for a lobule of a lung with a centrally obstructed bronchus may yet breathe satisfactorily by using the peripheral interconnections with adjacent free lobules. Van Allen and Lindskog termed this function collateral respiration. Collateral respiration plays two economic rôles in the lobular form of bronchial obstruction, namely, that of preventing the development of atelectasis and that of rendering important assistance to the broncho-eliminative forces. Collateral respiration may be excluded by closure of those airways along the margins of the obstructed lobule which have to do with the intercommunication. This may result from blockage with secretions or other materials or from a shut-down during periods of shallow breathing. The latter circumstance is probably a factor in the pathogenesis of postoperative atelectasis.

Treatment for Pulmonary Disease.—Although special training and experience and a trained organization are required to perform bronchoscopy safely and efficiently, Jackson [35] expressed the belief that the time was not far distant when every large hospital would have its bronchoscopic clinic. He briefly discussed a number of diseases from a bronchoscopic standpoint, and stated that bronchoscopy should no longer be considered a curiosity of medicine, resorted to only in occasional cases of foreign body. It has become an almost routine procedure as an aid to the physician and surgeon in the diagnosis and treatment of diseases of the chest. About 90 per cent of the bronchoscopies performed today in the large bronchoscopic clinics are done for disease of other than foreign body origin. On the other hand, largely as the result of bronchoscopic experience, it is to be realized that foreign body must never be lost sight of in the diagnosis of acute and chronic disease of the chest.

Pulmonary Abscess.—In the experience of Léon-Kindberg and Soulas,[36] spontaneous recovery from pulmonary abscess occurs in from 20 to 25 per cent of the cases. Surgical intervention is often necessary, but this usually is inadvisable before the eighth week. The authors believe that bronchoscopy should be employed as a medical aid and before operation is resorted to. They expressed the belief that bronchoscopy should be used in cases that have passed the acute stage, as it will cure many of these as well as the acute cases. It also is of real value as a preoperative measure in improving the patient's general con-

35. Jackson, C. L.: Bronchoscopy in the Treatment of Pulmonary Disease, Internat. Clin. **2**:151, 1931.

36. Léon-Kindberg, M., and Soulas, A.: Bronchoscopy in the Treatment for Abscess of the Lung, Presse méd. **94**:1591 (Dec. 22) 1930.

dition and localizing the infection. A series of 9 cases of pulmonary abscess were reported. Three were cases of acute abscess, and the patients promptly recovered following bronchoscopic aspiration. Two cases were seen during the subacute stage, and these improved rapidly under treatment. The 4 remaining patients had chronic abscesses. One of these promptly recovered following treatment. The others improved, but had a recurrence of the infection. One died and another is awaiting a surgical operation. With a single exception, all the patients were over 32 years of age. The authors concluded that the best results are secured in cases due to the ordinary pyogenic organisms; infections due to spirillae are less favorable.

In presenting a review of 100 cases of abscess of the lung, Miller [37] found that the analysis checked closely with the findings in other large groups of cases. Seven cases followed pneumonia. Eighteen occurred following operations; these included twelve tonsillectomies of which eleven were performed under general anesthesia. Of particular interest is the group in which an abscess developed as a result of the aspiration of foreign material. In 3 cases a tracheobronchial foreign body was found, and in 23 there was a definite possibility of aspiration, as there was unconsciousness. Alcoholism with vomiting figured prominently in this group. The upper lobes were involved in 39 per cent, the middle lobes in 10 per cent and the lower lobes in 46 per cent. In 4 per cent more than a single lobe was involved. The author emphasized the importance of bronchoscopic examination in determining the location of an abscess, particularly in cases in which the roentgen and clinical observations were inconclusive. Bronchiectasis was found to be the most common complication of pulmonary abscess, occurring in 8 cases. In 59 per cent of the cases in this series the condition was considered as arrested or improved. The author expressed the opinion that abscess of the lung is not cured, but is either arrested or improved. He agreed that there is a tendency toward a relapse even under ideal conditions.

In the experience of Moersch,[38] bronchoscopy was a necessary procedure in the diagnosis of pulmonary abscess as well as a valuable measure in treatment. In his series of 105 cases, tonsillectomy was the most common cause. In considering the location of the abscess with regard to treatment, it was found that the right upper lobe and the left lower lobe responded least favorably. The question of the frequency of bronchoscopy and the amount of drainage necessary must be determined on the basis of the physician's experience. It is important to avoid continuing treatments over too long a period of time, thereby

37. Miller, J.: A Review of One Hundred Cases of Abscess of the Lung, Ann. Otol., Rhin. & Laryng. **40**:1199 (Dec.) 1931.

38. Moersch, H. J.: The Treatment of Pulmonary Abscess by Bronchoscopy, Ann. Surg. **93**:1126, 1931.

increasing the surgeon's difficulties if bronchoscopy has been unsuccessful. The author concluded that bronchoscopy should be used in conjunction with medical and surgical treatment and that it affords one of the most efficient measures in the treatment for pulmonary abscess.

Bronchiectasis.—In a general survey of 56 cases of bronchiectasis, Boyd [39] found bronchoscopy the most satisfactory method of introducing iodized oil in addition to being an important diagnostic aid. In certain cases the involved bronchus was found to be so swollen and full of secretion that it was necessary to clear the airway before the oil could be instilled. Repeated bronchoscopic aspiration was found to be of benefit.

In considering bronchoscopy in the treatment for bronchiectasis, it must be recalled that the problem is totally different from that observed in pulmonary abscess. In my [40] opinion the first and most important consideration is to ascertain if the bronchiectasis is obstructive or nonobstructive. This information should be secured irrespective of the method of treatment to be employed. If due to obstruction, the bronchiectasis can often be treated successfully by bronchoscopy. In monolobar bronchiectasis in which no obstruction is present, and in bilateral involvement, bronchoscopy is largely a palliative measure in adults, being an aid to the surgeon or the internist. Repeated aspirations together with endobronchial medication will aid in decreasing the quantity of pus, relieve the stagnation and fetor and improve the condition of the bronchial mucosa, thereby aiding the activity of the cilia and increasing the effectiveness of postural drainage. Aid may also be given the surgeon to enable him to determine the extent of involvement, with or without the accurate placement of radiopaque substances; also in assisting patients in surgical cases to get rid of accumulated bronchial secretions. To the bronchoscopist, bronchiectasis offers more promise for improvement in children than in adults. Every case of unilateral bronchiectasis should have the advantage of diagnostic bronchoscopy to rule out possible endobronchial lesions. This is particularly important if surgical treatment is contemplated. In bilateral bronchiectasis in adults, bronchoscopy is an aid to the internist, and its benefits are temporary; in children, bronchoscopy combined with other appropriate measures is often followed by excellent results.

128 South Tenth Street.

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39. Boyd, G. L.: Bronchiectasis in Children, Canad. M. A. J. **25**:174 (Aug.) 1931.

40. Clerf, L. H.: The Bronchoscopic Treatment of Bronchiectasis and Lung Abscess, Am. Rev. Tuberc. **24**:605 (Dec.) 1931.

Abstracts from Current Literature

Ear

THE ACUTE EAR. ARTHUR H. NORTON, Northwest Med. **30**:330 (July) 1931.

Norton's treatment for otitis media following paracentesis is as follows: The canal is filled with 2 per cent mercurochrome-220 soluble, and the ear is plugged with cotton. The parent is instructed to change the cotton when it is soiled and to do nothing else. The patient is kept in bed with an ice bag to the ear. Every other day the canal is thoroughly irrigated by the physician with a 1:4,000 solution of mercuric cyanide. As soon as the discharge ceases, inflation of the salpinx and vibratory massage are begun. Norton begins his incision at the posterior fold of Shrapnell's membrane and carries it to the lower border of the drum. As an instillation for catarrhal ears he uses phenol and chloral hydrate, 1 drachm (1.77 Gm.) each to 1 ounce (28.35 Gm.) of glycerin.

SCOTT, Philadelphia [AM. J. DIS. CHILD.].

A CASE OF CEREBELLAR ABSCESS. COURTENAY YORKE, Brit. M. J. **1**:891 (May 23) 1931.

A rather unusual case of cerebellar abscess, with a satisfactory convalescence and recovery is reported. The illness began with an infection of the ear, followed in two weeks by symptoms of acute mastoid disease. A few days later, acute osteitis of the mastoid was confirmed by operation, and a considerable amount of pus was evacuated. For five days the patient progressed normally. Then vomiting and lethargy developed, but the temperature and pulse were normal, and there was no headache. This was soon followed by refusal to accept food, deepening coma, incontinence, staring eyes, unequal pupils, the right being irregular, and slight deviation of the right eye downward and outward. There was no nystagmus or papilledema. The temperature was 97.5 F. and the pulse rate, 76. An abscess of the brain was diagnosed, but its location was in doubt. The temporosphenoidal lobe was explored, but no pus was found. An attempt was made to explore the cerebellum, but the patient's condition became so alarming that the operation had to be terminated. The coma deepened, and lumbar puncture revealed clear fluid under pressure. After the administration of a small hypodermic of morphine (no general anesthetic), the cerebellum was again explored. Insertion of a knife in various directions to the depth of 1 inch (2.5 cm.) revealed no pus. A needle was then substituted, and at a depth of 1½ inches (3.7 cm.) a drachm of pus was evacuated. A small rubber drainage tube was inserted. Immediately the patient improved. Fifteen days later, there was a sudden relapse, and the patient was almost moribund. The drainage tube was again inserted. Convalescence was slow but gradual. Three months later, recovery was complete.

The author's conclusions are: 1. Abscess of the brain may develop insidiously, and the first intimation may be insidious coma. 2. With a hypodermic syringe, pus may be discovered when other means have failed. 3. Drainage should be continued as long as possible.

FERGUSON, Niagara Falls, N. Y. [ARCH. NEUROL. & PSYCHIAT.].

TECHNIC OF ARTIFICIAL TYMPANIC MEMBRANE. G. ALEXANDER, Monatschr. f. Ohrenh. **65**:997 (Aug.) 1931.

Alexander points out that Gomperz's method of using silver foil as prosthesis in defects of the tympanic membrane constituted a considerable progress in the

treatment of suppurations of the middle ear. However, this prosthesis had also certain disadvantages, and the author describes a new prosthesis, the use of which eliminates many of the shortcomings of the earlier one.

EDITOR'S ABSTRACT.

INTERNAL OSTEOMA OF MASTOID. H. BURGER, Monatschr. f. Ohrenh. **65**:1447 (Nov.) 1931.

Burger reports the clinical history of a man, in whom at the age of 26, a gradually increasing baryecoia of the right ear was discovered. For several years there were no other symptoms than the baryecoia, then the ear become painful, secretions appeared, and a swelling developed below the ear, which appeared to be a scrofuloderm, but the histologic examination did not corroborate this diagnosis. Shortly after that the osteoma, which was somewhat larger than a walnut, was removed. During the operation the author gained the impression that it originated at the base of the middle cranial fossa, and that during its growth it misplaced the posterior wall of the auditory meatus as well as the planum mastoideum. The histologic examination of the growth revealed an eburnated osteoma, which differs from osteophytes and from exostoses by its gradual and continuous growth. The etiology of this neoplasm remains obscure. That the inflammation of the middle ear cannot be considered the cause is proved (1) by the chronologic order in which the symptoms appeared, (2) by the mildness of inflammation in the tympanic cavity and (3) by the absence of inflammation in the antrum and in the mastoid. In contradistinction to the comparatively frequent exostoses of the auditory meatus, a true osteoma in the interior of the mastoid is comparatively rare, but it resembles greatly the osteomas of the frontal sinus.

EDITOR'S ABSTRACT.

TRANSAURAL OPERATION ON NEOPLASMS OF THE ACOUSTIC NERVE. G. ALEXANDER, Ztschr. f. Laryng., Rhin. (Teil 1: Folia oto-laryng.) **21**:180 (June) 1931.

Alexander's aim is to show the advantages of the transaural method for the removal of tumors of the acoustic nerve and to advocate its application. After enumerating the shortcomings of the occipital exposure method of Krause-Cushing in the surgical treatment of tumors of the cerebropontile angle and of the acoustic nerve, he shows that most of the objections to the transaural method that have been cited are unjustified, and he mentions points that others have cited in favor of the transaural method. Further, he gives the clinical history of a patient on whom he performed the transaural operation; he then discusses the details of the technic. He is convinced that the transaural method is best suited for those tumors of the acoustic nerve which are located in the internal acoustic meatus, and which usually spread in the lateral direction. In this type of neoplasm the transaural method should always be employed, since to reach the growths by the occipital method is much more difficult. The position of the head is of the greatest significance for the success of the operation. If the topographic conditions are favorable, that is, if the bulbus jugularis does not reach too far upward, the transaural method can be employed even in tumors of the acoustic nerve that have spread intradurally. In order to determine the exact position of the bulbus jugularis, roentgenoscopy should precede the operation, for in cases of marked upward misplacement or ectasia the transaural method is not advisable. A sigmoid sinus that extends in front and a high floor of the tympanic cavity indicate a far upward reaching bulbus. Contraindications to the transaural method are therefore not the size and the position of the tumor but only a maximal upward misplacement or ectasia of the bulbus jugularis.

EDITOR'S ABSTRACT.

CLINICAL AND PATHOLOGIC EXPERIENCES IN OTITIS MEDIA DURING CHILDHOOD. W. UFFENORDE, Ztschr. f. Laryng., Rhin (Teil 1: Folia oto-laryng.) **21**:308 (July) 1931.

Uffenorde first calls attention to the chronic inflammation of the auditory tubes which is frequently observed in children. He found that this condition was refractory to most therapeutic measures, but also observed that paracentesis of the tympanic membrane usually improved the hearing capacity, at least as long as the perforation was kept open. However, as soon as the opening closed, the audition became impaired again. All the therapeutic measures that are employed in exudative diathesis the author considers advisable, in that most of these children are subject to it. Relapses of the auditory disorder are quite frequent, and it is probable that local factors such as a hypertrophy of the peritubal cells are the cause of the prolongation. Also worthy of consideration is the fact that in many cases the pneumatization process is completely inhibited. A permanent improvement often does not set in until after puberty, when the general condition and the resistance have improved. Another aspect of otitis media, to which the author calls attention, is a sudden swelling behind the ear in children, in whom previous to that, there were neither auditory disturbances nor a discharge from the ear. He does not consider this swelling as a manifestation of a primary mastoiditis, but rather thinks that this proves that the tympanic membrane has often more resistance than the thing bony closure toward the antrum. In cases of this nature, paracentesis is advisable. Although otitis media usually takes a harmless course during the nursling age, the author warns that pediatricians should not underestimate its seriousness and consider paracentesis as unnecessary, for of 692 children with otitis media who came under his observation, 329 had to undergo paracentesis, and in 151 antrotomy had to be resorted to. Further, the histologic observations on the petrosas of 12 young children are discussed: It was found that the most common form of otitis in nurslings is the simple, suppurative exudative inflammation. The process does not differ from that observed in adults. In the last part of the article, the author shows how in nurslings the closed otitis media leads to labyrinthitis.

EDITOR'S ABSTRACT.

FAMILIAL OCCURRENCE OF INFLAMMATORY DISEASES OF THE MIDDLE EAR. H. RICHTER, Ztschr. f. Laryng., Rhin (Teil 1: Folia oto-laryng.) **21**:319 (July) 1931.

After reviewing the literature, Richter shows on genealogical trees that inflammatory diseases of the middle ear, especially chronic suppurations, may be hereditary. These inflammations of the middle ear, which develop as the result of an inferior organ constitution, may be passed on uninterruptedly or may occur sporadically. There is no marked difference in the behavior of the two sexes. The slightly higher incidence in man can be accounted for by exogenic factors. It is further pointed out that persons who are affected with hereditary aural diseases usually show other defects. The author calls attention to the great frequency of tuberculosis in the families in which aural diseases are hereditary. Because of the close relationship between ear and nose, and ear and nasopharynx, pathologic changes in these regions, particularly the hyperplastic forms of the pharyngeal lymphatic ring should be watched for. The family anamnesis and general habitus of a patient with aural disease should be given consideration, because the information thus gained will be helpful for the prognosis.

EDITOR'S ABSTRACT.

HEARING CAPACITY AND PREGNANCY. G. STIEB, Ztschr. f. Laryng., Rhin. (Teil 1: Folia oto-laryng.) **21**:334 (July) 1931.

Stieb determinated the hearing capacity of sixty-seven women during pregnancy and after confinement. In only five cases was there a slight improvement

after the confinement. In all other cases the hearing capacity was the same before and after labor, or there was a slight impairment after confinement.

EDITOR'S ABSTRACT.

CHRONIC SUPPURATION OF MIDDLE EAR WITH PERFORATION OF SHRAPNELL'S MEMBRANE, SUSPECTED ABSCESS OF THE CEREBELLUM: CYST FROM STASIS OF CEREBROSPINAL FLUID AS RESULT OF HEMORRHAGIC INTERNAL PACHYMENINGITIS. R. BÜHR, Ztschr. f. Laryng., Rhin. (Teil 1: Folia oto-laryng.) **21**:443 (Aug.) 1931.

Bühr gives the clinical history of a man, aged 55, who suffered from headaches and suppurative secretion from the left ear. The hearing capacity of the left ear had always been poor, and recently the walking became unsteady. Following a motor cycle accident the headaches became more severe, the walk more staggering, the speech indistinct and monotonous, and insomnia developed. The anamnesis revealed that the suppuration of the middle ear had existed for thirty years. After a careful examination, the case was diagnosed as chronic purulent otitis media with perforation of shrapnell's membrane, and either an abscess or a tumor on the left side of the cerebellum was suspected. The operation revealed marked sclerosis of the mastoid process. On opening the antrum, it was found that it contained pus. Repeated careful revision of the operative cavity gave no indication for an abscess of the cerebellum. Since the clinical aspect indicated a pathologic process in the posterior cranial fossa, the posterior wall of the pyramid was opened and a cyst the size of a dove's egg was discovered, which yielded one eighth of a liter of fluid. The presence of this cyst explained the cerebral symptoms. After the operation the Babinski sign disappeared, and the patient's mental condition was clearer. However, the general condition became steadily worse. The sputum was fetid, and friction sounds were noticeable in the region of the lower left lung. The heart action became weaker, and the patient died several weeks after the operation. In the discussion of the case, the author expresses the opinion that the subdural hemorrhage, which resulted from the motor cycle accident, was the primary factor in the development of the cyst. By subsequent hemorrhages the pressure on the hemispheres of the cerebrum became so severe that a stasis of the fluid resulted, and a large cyst formed in the posterior cranial fossa. The cerebellar symptoms caused by this cyst and the simultaneously existing suppuration of the middle ear caused the difficulties in the differential diagnosis.

EDITOR'S ABSTRACT.

Pharynx

KINGSTON SEPTIC SORE THROAT OUTBREAK CAUSES SIX DEATHS. HEALTH NEWS (New York State Dept. Health) **7**:163 (Oct. 13) 1930.

One hundred and fifty-one cases of septic sore throat were reported, with six deaths. The epidemic was due to raw milk from one cow. Hemolytic streptococci isolated from this milk were morphologically and culturally identical with organisms secured from the patients' throats.

AIKMAN, Rochester, N. Y. [AM. J. DIS. CHILD.].

FOUR CASES OF PRIMARY GANGRENE OF THE PHARYNX. S. BARBERA, Arch. ital. di otol. **42**:413 (Sept.) 1931.

Primary gangrene of the pharynx should not be considered an extremely rare phenomenon; however, the sporadic form of diphtheria, which it was thought to be in the past, is quite rare. Three of the patients under observation harbored the streptococcus; the disease assumed an acute course, sufficiently intense symptoms being manifested in the beginning of the disease. In one case, on the contrary, Bacillus perfringens was found as a secondary invader, and the disease assumed

chronic manifestations and not extremely intense general symptoms. All four cases appeared independently of each other, but in the same short interval of time, and under the environmental and atmospheric conditions that favor the evolution of this entity. The streptococcus seems to be the principal pathogenic agent in primary gangrene of the pharynx. In the occasional instance in which Bacillus perfringens is also present, the course of the disease is prolonged and the general symptoms are not distinct. Antistreptococcus serum administered early is a favorable therapeusis: the life of one patient was saved, but in two other patients failure was attributed to belated treatment. The specific bacteria should be used in the preparation of serums; a serum for Bacillus perfringens was effective in the fourth instance studied.

EDITOR'S ABSTRACT.

PHARYNGEAL DIVERTICULUM IN A MANGABEY. C. NEGUS, Monatschr. f. Ohrenh. **65**:1388 (Nov.) 1931.

Negus reports a pharyngeal diverticulum in a mangabey monkey, and then states that pathologic pharyngeal diverticula, as they occur in human beings, are probably extremely rare in animals. The theoretic discussions are corroborated by the author's observations. For the assumption of deficient relaxation or of excessive contraction (tonus) of the cricopharyngeal sphincter as the cause of this, there is little support. However, the knowledge about analogies and differences in the anatomic structure of the pharynx in human beings and in animals is sufficient to find an explanation for the fact that in human beings the posterior wall of the pharynx is predisposed for hernia formation, whereas in animals that is not the case.

EDITOR'S ABSTRACT.

Nose

LUPUS VULGARIS OF THE NOSE AND UPPER RESPIRATORY TRACT; TREATMENT WITH RADIUM. E. MARTIN FREUND, New York State J. Med. **31**:1273 (Oct. 15) 1931.

The incidence, etiology, paths of invasion and the more common varieties of this disease are reviewed, and a case is reported in detail. The patient received a number of radium treatments followed by a partial plastic operation to reshape her nostrils. In the author's opinion, radium therapy was by far the most efficient treatment, particularly in regions inaccessible to surgical intervention and roentgen exposure.

TRAUB, New York [ARCH. DERMAT. & SYPH.].

SYNDROME OF THE SPHENOID FISSURE. A. HAUTANT, Ann. d'oto-laryng. **18**:15 (Sept.) 1931.

Hautant states that immobility of the eye with ptosis of the upper eyelid, suborbital neuralgia and even hypesthesia of the frontal nasal region and the cornea constitutes the syndrome of the sphenoid fissure. These symptoms are produced by every lesion that develops in or about this fissure. Blindness can be added to the syndrome to form the syndrome of the orbital apex.

The author reports the case of a young man who was fairly suddenly seized with ptosis of the right upper eyelid and incomplete immobility of the eyeball. These symptoms were preceded and accompanied by a facial neuralgia localized in the superior maxillary nerve in the form of violent paroxysmal attacks of pain. The vision was normal; the pupil reacted to light, and there was no papillary stasis. It was a question of an incomplete syndrome of the sphenoid fissure, since there was still mobility and the pupil was uninvolved.

Nasal, ophthalmologic and neurologic examinations gave negative results. The ophthalmologist felt that in a young patient the syndrome of the sphenoid fissure pointed to a syphilitic periostitis of the greater wing of the sphenoid, so that in spite of the absence of every sign of syphilis, he advised antisyphilitic treatment. This was given, without any particular improvement.

Three months after the onset of the symptoms the vision in the right eye suddenly became reduced to perception of light. At this time Hautant saw the patient, and he found that the ophthalmoplegia was accentuated; the ocular globe was fixed; slight exophthalmos was present; the fundi were normal, severe neuralgia of the superior maxillary nerve was present, while nothing abnormal was to be seen in the nose.

Another roentgen examination showed the sphenoid fissure to be opaque, with extensive decalcification of the greater wing of the sphenoid. Hautant thought that a pathologic process was developing in the region of the lower lip of the sphenoid fissure and in the upper part of the pterygomaxillary fossa.

A diagnosis of malignant tumor was made, and the patient was given treatment with radium, with slow improvement in his symptoms. The neuralgia disappeared; the eye resumed its mobility, and the blindness persisted. A year later the condition remained the same.

In discussing these tumors the author states that in general they are formed in the nose and spread into the pterygomaxillary fossa. At times they develop at the base of the skull.

It was, of course, impossible to obtain a biopsy specimen in the case reported.

HARRIS H. VAIL.

CONGENITAL CYST OF THE ORBIT OF ETHMOIDAL ORIGIN. P. VANCEA, Riv. oto-neuro-oftal. **8**:222 (May-June) 1931.

A congenital cyst of the orbit not associated with a developmental anomaly of the eyeball is very rare. The only similar case described by Panas in his treatise of 1894 was ascribed to a lacrimal origin.

The author has a different point of view.

His patient presents a normal eyeball and a cyst situated in the lower and inner angle of its orbit. The swelling appeared soon after birth and is associated with a homolateral congenital anomaly of refraction. Its congenital origin seems, therefore, beyond dispute. He admits the possibility of a fetal and intra-orbital inclusion of ethmoid mucosa because ethmoid cells are already formed in a 6 months embryo and are developed at birth; their cell walls nearest the orbit are very thin, and the corresponding os planum is often dehiscent between its anterior and posterior two-thirds. In the latter condition the ethmoid cells have wide orbital openings and are separated from the orbital cavity by very thin periosteum.

In fact, at operation the cyst pedicle was followed through to the medial orbital wall, i. e., to those ethmoid cells (agger nasi or preinfundibular cells) which almost surround the lacrimal fossa. Some have called them lacrimal cells because Stanculeanu (1902) showed that they open into the anterior superior portion of the unciform fossa. This makes clear why an anterior ethmoiditis may produce pain here, made worse by pressure, and why all collections and new formations here tend to appear in the lower and inner angle of the orbit in proximity to the lacrimal sac.

Moreover, no sebaceous glands exist in the mucosa lining the lacrimal passages. Such glands are present in the mucosa of the paranasal sinuses.

Histologic examination of the cyst extirpated from the author's case showed the presence of sebaceous glands, thus confirming its ethmoidal origin. The cyst wall showed a diffuse lymphocytic infiltration and a marked hyaline degeneration at its periphery so characteristic of old congenital cysts and so rare in young persons. These degenerative changes in a young patient (22 years) had not yet become generalized through the entire cyst.

V. R. SYRACUSE [ARCH. OPHTH.].

NATURE OF ANGIOMATOSIS. K. ULLMANN, Monatschr. f. Ohrenh. **65**:1147 (Oct.) 1931.

In the introduction, Ullmann points out that the disease of the nasal mucous membrane, which Osler in 1901 designated as "multiple hereditary hemorrhagic

telangiectasis," was described by him as early as 1894 and 1900 and was designated by him as "eruptive angioma formation," or as "angiomatosis." He then mentions other investigators who before and after that time have studied this condition, and he mentions the different terms that have been applied to it. A review of the various reports indicates that some authors stress the hemorrhage as the main symptom and others the new formation of vessels, but nearly all reports call attention to its peculiarity as a constitutional anomaly. The author emphasizes that exact histologic and other studies show that the definition of angiomatosis can be based only on anatomic facts and not on superficial and changing symptoms. He then reports observations on four cases. In his summary of the histologic findings, he states that in the numerous newly formed vessels there are distinct, often considerable, endothelial proliferations without an increase in the layers of the endothelium, that is, there are nowhere intravascular papilloma that are found in the so-called endothelioma and endothelial sarcoma. The author further discusses the changes in the connective tissue, especially its abnormal richness in vessels. Some of these have as yet no walls, that is, there is no endothelium. The presence of wall-less vessel spaces and the tendency to form vessel spaces in the midst of connective tissue the author considers as characteristic of angiomatosis. He further reviews the various reports on the condition of the blood in angiomatosis. The tests that were made in one of his cases gave negative results, but he states that some investigators consider it a special kind of hemophilia, with fragility of the capillaries, prolongation of the coagulation time and of the bleeding time, and some maintain that the calcium content of the blood is reduced. Further, the hereditary character is discussed, and the rôle of trauma is evaluated. In regard to the treatment it is stated that since Osler calcium therapy has been recommended, but the results have been negligible. Injections of horse serum (about twenty during the year) are said to reduce the bleeding tendency without producing anaphylactic conditions in these patients. The author has seen favorable results only from extirpation or from cauterization. In his final summary on the nature of angiomatosis, he states that since internal noxa and pathologic blood conditions cannot be demonstrated, the cause must be in the skin itself. As such he considers the tendency of the connective tissue to form spontaneously or in reaction to irritation, multiple angioma. He considers it an abnormal skin reaction rather than a skin eruption.

EDITOR'S ABSTRACT.

COMPLICATIONS IN SUPPURATIONS OF MAXILLARY ANTRUM. G. BRÜHL, Monatschr. f. Ohrenh. **65**:1301 (Nov.) 1931.

Brühl shows that complications apparently caused by suppurations of the maxillary antrum are frequently a progressing odontogenic periostitis and osteomyelitis of the maxilla with a spreading of the suppuration to the adjoining soft parts, and by way of phlegmon or thrombophlebitis, they may become septic diseases. The simultaneously existing suppurations of the maxillary antrum in such cases cannot be considered as the original disease focus but rather as a secondary manifestation in the course of the maxillary disease. The author gives the clinical history of a case, which is a characterictic example of an odontogenic periostitis with secondary involvement of the maxillary antrum, and with severe putrid perimaxillar phlegmon. However, there was a very unusual course in another case, in which the suppuration of the maxillary antrum was primary and not of odontogenic origin. There developed a progressing, putrid infection of the mucous membrane of the maxillary antrum, a putrid osteomyelitis of the maxilla, the ethmoid bone and the palate, and finally a nomalike gangrene of the surrounding soft parts, which led to aspiration pneumonia and ended fatally. The author states that the literature contains no other report on such a case.

EDITOR'S ABSTRACT.

OPERATIVE TREATMENT FOR CHRONIC INFLAMMATION OF MAXILLARY SINUS. M. PAUNZ, Monatschr. f. Ohrenh. **65**:1332 (Nov.) 1931.

In the surgical treatment for chronic inflammation of the maxillary sinus either an endonasal or a facial method can be employed. As a disadvantage of the endonasal methods, Paunz considers the fact that they do not permit a good view of the operative field, and for severe cases of chronic inflammation he therefore recommends those surgical methods by which the maxillary sinus is opened widely, which is done by the Caldwell-Luc and by the Denker operation. Such methods are employed wherever rational surgical rules are followed. However, the authorities differ as to whether only the diseased portions of the mucous membrane should be removed or whether it should be removed completely. The author considers the latter as most effective. In regard to Denker's operation, he states that although it is of great value for removal of tumors, he never found it necessary in the treatment for suppurations of the maxillary sinus. He found that the Caldwell-Luc operation was sufficient even in the severest cases of inflammation of the maxillary sinus. He describes in detail the procedure, which he follows, and asserts that if his technic is employed a single intervention frees the patients from their troubles and they are not obliged to repeat the visits to the doctor for weeks or even months. The endonasal methods he recommends for those cases in which temporary exacerbations cause annoyance.

EDITOR'S ABSTRACT.

MUCOPERIOSTEAL COVERING OF NASAL SEPTUM AND ITS CONSIDERATION IN SURGICAL TREATMENT OF DEVIATIONS OF SEPTUM. H. NEUMANN, Monatschr. f. Ohrenh. **65**:1399 (Nov.) 1931.

Neumann points out that during the submucous resection of the nasal septum for counteracting deviations and cristas, the mucous membrane is occasionally injured. These perforations are usually found along the upper margin of the vomer and increase in frequency from the front backward; that is, they are usually found in the region of the suture between the cartilago quadrangularis and the vomer. Of course, perforations may also be found outside of this line; for instance, they may develop when the mucoperiosteal covering is removed from the peak of the cristas and spines. The typical location of the perforations indicate that the anatomic structure may be responsible, and the author's investigations corroborated this and also gave pointers for the technic of the operation. After giving a detailed discussion of the anatomic conditions, he describes the technic and stresses that when the upper margin of the vomer has been reached, the connective tissue strands going inward should be sharply divided, and in this manner one can easily reach the space between the vomer and the mucoperiosteum. He begins the submucous resection always on the convex side with a downward incision that divides the mucous membrane down to the cartilage or the bone, and outgoing from this opening he lifts the perichondrium only in the region of the cartilago quadragularis but does not lift the periosteum from the vomer. The author continues the detailed description of the operative technic, and in the conclusion points out that although the perforation is not as grave a condition as the patient may assume, it should nevertheless be avoided, for it may cause annoyance by crust formation and respiratory sounds.

EDITOR'S ABSTRACT.

VACCINE THERAPY OF OZENA. D. S. DEMETRIADES, Monatschr. f. Ohrenh. **65**: 1425 (Nov.) 1931.

Demetriades reports fifteen cases of ozena, in which he employed a vaccine of the Perez-Hofer bacillus. He describes the preparation of the vaccine and the technic of the treatment, and states that his therapeutic results corroborate former favorable reports. He considers it satisfactory if the two main symptoms, namely, crust formation and fetor, are counteracted, for if this is accomplished the patients can be considered as practically cured. However, the vaccine therapy accomplishes more than that; it also improves the olfactory sense.

EDITOR'S ABSTRACT.

Miscellaneous

DENTAL PROSTHESIS LOCATED AT ENTRANCE OF ESOPHAGUS FOR TWO AND ONE-HALF YEARS. E. J. MOURE, Monatschr. f. Ohrenh. **65**:1297 (Nov.) 1931.

Moure relates the clinical history of a woman, aged 27, who consulted her physician because of difficulties in swallowing, which had developed several days previous without apparent cause. The author gives the physician's report of the results of the laryngoscopy and of the esophagoscopy and states that when expectant treatment failed, a primary laryngeal tuberculosis was thought of, and suitable therapeutic measures were instituted, but without effect. The further course of the disorder made the existence of hereditary syphilis appear probable, but antisyphilitic therapy likewise remained ineffective. Now, two and one-half years after appearance of the first symptoms, roentgenoscopy of the larynx and the trachea was suggested, and at this time the woman related that several days before she experienced the first difficulties, she had missed her gold prosthesis on awakening in the morning, but at that time she had given it no further thought. This admission on the part of the patient convinced the author that all the symptoms had been caused by the presence of a foreign body, and a roentgenoscopy two days later revealed the dental prosthesis, consisting of four teeth and two hooks, at the entrance of the esophagus. An operation was performed, which improved the patient's condition considerably. The author's object in reporting this case was to emphasize the necessity of roentgenoscopy in all doubtful cases.

EDITOR'S ABSTRACT.

STROBOSCOPIC DIAGNOSIS. E. N. MALJUTIN, Monatschr. f. Ohrenh. **65**:1356 (Nov.) 1931.

Maljutin agrees with Stern, who designates stroboscopy as the microscopy of laryngoscopy and stresses its great significance for phoniatricians and laryngologists. He relates observations that he made in the laboratory for experimental phonetics in a musical academy of Moscow. His object in making this report was to call the attention of the laryngologists to stroboscopy and to study the pathology of the voice by means of stroboscopy.

EDITOR'S ABSTRACT.

MYXEDEMA IN PATIENTS WITH OTORHINOLARYNGOLOGIC DISORDERS. M. MANN, Monatschr. f. Ohrenh. **65**:1363 (Nov.) 1931.

Mann reports the clinical histories of four patients with myxedema, each of whom showed different symptoms. The first patient consulted him because of repeated inflammation of the middle ear and of suppurations of the accessory cavities. The second one complained of hoarseness and pharyngeal disorders; in the third patient there existed pressure on the trachea and also dyspnea, and in the fourth patient thyroidectomy had been done and a hypophyseal tumor found. Administration of thyroidal extract effected improvement in all four instances. In discussing the etiology, the author points out that the first two patients were men who were under great mental strain, and in one of them hereditary conditions indicated the possibility of an inferiority of the endocrine system. In addition to the myxedema, there also existed in these two patients certain symptoms of exophthalmic goiter, such as thirst, sweating, diarrhea and increased irritability. The author asserts that such mixed cases are occasionally observed, but because of the aforementioned thyrotoxic symptoms the thyroidal extract was at first given in small doses, but it was surprising to observe that these symptoms appeared most rapidly after the thyroidal treatment had been instituted. In the third case, which concerned a primipara, aged 40, it is assumed that pregnancy and dystocia were the cause, and in the fourth case it appears as if the hypophyseal tumor and the myxedema were both the result of the total absence of the thyroid (thyroidec-

tomy). The author's object in reporting these cases was to call attention to the fact that in patients with refractory disorders of the ear or of the upper air passages myxedema may exist, and he is convinced that myxedema is not as rare as is commonly believed.

EDITOR'S ABSTRACT.

ASPIRATION OF DENTAL NEEDLES: ITS PREVENTION. C. VON EICKEN, Monatschr. f. Ohrenh. **65**:1384 (Nov.) 1931.

According to von Eicken, dental plates, extracted teeth and dental instruments make up a large proportion of the foreign bodies that have to be removed from the esophagus. The author is convinced that it will never be possible to prevent such cases entirely, but he thinks that the swallowing of a Kerr needle ought to be preventable. After reporting six cases of aspiration of this type of needle, he discusses methods by which it can be prevented. He considers the use of the coffer dam as the best protection against the swallowing of root or nerve needles, but he also admits that in the case of molars the rubber membrane may be a hindrance. For such cases he advises the insertion of the needle into a holder to which a fine chain with ring is attached; this ring is put on the little finger. The author considers this precaution as absolutely necessary.

EDITOR'S ABSTRACT.

SELF-OBSERVATION ON SEASICKNESS. G. ALEXANDER, Monatschr. f. Ohrenh. **65**:1396 (Nov.) 1931.

Alexander relates observations that he made during a trip across the Atlantic. He did not become actually ill with seasickness, but he had the prodromal symptoms, such as yawning, eructation, tiredness and paleness. During this condition he could still read with interest, and he considers this as important as the deviation of the interest from the indisposition and the concentration on the reading help to prevent an attack of seasickness. During this period of the prodromal symptoms, the observation of the movements of the boat have a sickening effect, especially watching the railing of the deck against the horizon. This feeling is the more pronounced the less active one is. The main cause of seasickness is the prolonged passive movement to which the resting body is subjected, and when these movements become irregular, severe disturbances may develop. The author felt suddenly a pressure in both orbits, later also contractions of the perineal muscle without an urge to defecate or urinate. These symptoms were exacerbated by optic vertigo, which set in as soon as the movements of the boat were watched. Increased salivation was also noted. The symptoms could be mitigated by lying down either on the back or the side. Good ventilation of the rooms or staying in the fresh air on deck likewise mitigated the indisposition. After a short while, when the author had become accustomed to the rhythm of the boat, he felt better, for then the body made unconsciously compensating movements. The author is convinced that being sea-fast, or being a good sailor, is mainly due to the complete compensation of the movements of the boat by following them imperceptibly with the body. Thus the disturbance of the equilibrium ceases, the movements of the boat are compensated automatically in such a manner that the body is always about in the vertical position.

EDITOR'S ABSTRACT.

TREATMENT FOR STENOSIS OF BILATERAL POSTICUS PARALYSIS. O. KAHLER, Monatschr. f. Ohrenh. **65**:1438 (Nov.) 1931.

Of the numerous methods that have been recommended for the treatment for stenosis that results from bilateral posticus paralysis, Kahler found Rethi's operation the most satisfactory, especially when it was done in combination with caustic escharization of the basis of the vocal folds in the ventricle. He gives the case histories of five patients, in whom he employed this method, and mentions several other authors who employed Rethi's operation with good success. He also gives a description of the technic.

EDITOR'S ABSTRACT.

Society Transactions

MASSACHUSETTS EYE AND EAR INFIRMARY, OTO-RHINO-LARYNGOLOGICAL SERVICES

EDITED BY PHILIP E. MELTZER, M.D.

Regular Weekly Meetings, May 27 to June 24, 1931

POUCH OF THE ESOPHAGUS, ONE YEAR AFTER OPERATION. DR. G. B. FRED.

A patient, 67 years old, had had difficulty in swallowing for two years. At the time that he presented himself at the hospital for treatment he was able to swallow only water and thin soup. The history was typical of pouch of the esophagus. He was operated on one year before this meeting. I present the case now to show the end-result. The pouch was removed by the two-stage operation. The first stage of the operation, performed under ether anesthesia, consisted of exposing the pouch through an incision in the side of the neck. The pharynx was exposed and the pouch was dissected free. The fundus was brought up to the edge of the skin, care being taken that no tension was put on the lumen of the esophagus. The second stage of the operation was done a week later under local anesthesia. An attempt was made to dissect the mucous membrane of the sac from its fibrous covering directly to the opening in the esophagus, but this was unsuccessful. The sac with its fibrous covering was dissected free, sutures were placed through its neck and it was then removed. The stump was transfixed in the neck and the wound was closed. At this examination, one year after operation, the patient is able to swallow and eat everything, and his general health is greatly improved. It is to be remembered that previous to the operation he could swallow only liquids.

DISCUSSION

DR. H. P. MOSHER: I have been greatly interested in this case of esophageal pouch, and I feel that the operation should be done in this institution rather than by the general surgeons. Dr. Frank Lahey who has had many such cases at the Lahey Clinic has had quite uniform success with this operation as described. The second operation for pouch of the esophagus done here was only about 50 per cent successful.

CASE OF ACUTE SINUSITIS WITH ORBITAL ABSCESS. DR. F. E. GARLAND.

A young man has been ill for about six weeks. He was treated by a nose and throat specialist for some time. On admission he presented the following picture: The right eye was closed, the upper lid was markedly reddened and edematous, and there was considerable but not excruciating pain. Profuse purulent secretion was seen in both sides of the nose. The roentgen report by Dr. A. S. MacMillan previous to the operation reads: "Pansinusitis, bilateral. The anterior wall of the frontal sinus is very thin. The sinus is filled with thickened membrane and secretion. The left antrum contains pus. No evidence of osteomyelitis." This is a case of pansinusitis with orbital abscess in a very ill patient. I applied hot flaxseed poultices for a few days; the eye continued to swell and the pain continued. Under ether anesthesia I made a small incision through the right eyebrow down to the periosteum and evacuated a considerable quantity of pus, which was under pressure. The pus came from an opening in the floor of the right frontal sinus. A drain was inserted. I did not remove any bone, nor did I explore in

any way. I thought that it was necessary to establish better drainage in the nose, so I took off the anterior tip of the right middle turbinate and at the same time punctured and washed the right antrum. The patient did well for two days and then had a profuse hemorrhage which required repacking under ether. At the same time a transfusion was given. There has been no bleeding since. Nothing more has been done.

DISCUSSION

DR. A. S. MACMILLAN: The last set of roentgenograms showed a slight thickening running along the outline of the right frontal sinus. There was never any evidence of osteomyelitis of the bone, and there is none now. The rest of the sinuses show a similar stage of resolution.

DR. H. P. MOSHER: This case is an example of watchful waiting. Most of us would have been much tempted to operate more extensively. If one has Dr. Garland's experience and judgment, one is justified in treating the patient as he did; if not, one is liable to get into trouble.

CASE OF PULMONARY ABSCESS FOLLOWING TONSILLECTOMY. DR. R. J. FRACKLETON.

A man, aged 28, was admitted to the Eye and Ear Infirmary for tonsillectomy. The record shows that I removed his tonsils and adenoids on April 16, 1931. He went home and felt well for six days. On the sixth day he had a rather sharp pain in the right lung at about the level of the second rib. The next day he spit up 1 or 2 ounces of thick pus. The following day he raised considerable brownish sputum, which greatly relieved the pain in the chest. On April 29, 1931, twelve days after the tonsillectomy, he was admitted to the Massachusetts General Hospital complaining of a foul breath, cough and expectoration of about 4 ounces (113.4 Gm.) of pus in twenty-four hours. He had lost 12 pounds in weight (5.4 Kg.). A roentgenogram showed a small abscess at about the level of the second and third ribs on the right side with the apex toward the hilus of the lung. The patient was treated by the medical service, chiefly by postural drainage. His temperature, pulse rate and respiration became normal. At no time did they go much above normal. The patient is feeling well and has regained his appetite.

DISCUSSION

DR. H. P. MOSHER: Was ether anesthesia used?

DR. R. J. FRACKLETON: Yes. He did not bleed much. I used the upright position with suction. There was nothing unusual about the case either during or after the operation.

DR. H. P. MOSHER: In your opinion, Dr. Smyth, do we have more cases than there should be?

DR. D. C. SMYTH: I think that there are about the same number of cases of postoperative abscess right along. My feeling is that one should be more particular about the method of etherization. Anesthesia should be of the right depth, not too light, yet not too deep. Bleeding should be controlled at all times and the patient should be under constant observation to prevent blood from running down into the hypopharynx. We depend too much on suction, which is a mistake as it cannot take up excessive bleeding. The tonsillar fossae should be in good view at all times, so that the operator can know what is going on. During the operation on the adenoids anesthesia should be light enough to have all the reflexes present, and the head should be placed in the proper position for drainage.

DR. H. P. MOSHER: Should we give up the upright position in all cases and operate only with the patient in the lying-down position?

DR. D. C. SMYTH: No. I believe that bleeding can be controlled just as well if not better in the upright position.

DR. H. TOBEY: What percentage of the abscesses that we see here do you consider to be embolic and what percentage inspiratory?

DR. D. C. SMYTH: I do not know the percentages offhand, but the abscesses are mostly inspiratory, the result of operations on the nose and throat; occasionally they occur from extraction of teeth. In the inspiratory type the symptoms appear in from thirty-six to forty-eight hours; there are pain and cough followed in three or four days by foul sputum, the patient appearing very ill. In embolic abscess the symptoms do not come on for about ten days after operation.

DR. P. E. MELTZER: Do you find abscesses more prevalent in adults than in children? We do not see many of them in children, considering the greater number of tonsillectomies performed on children in comparison with adults.

DR. D. C. SMYTH: We see quite a few in children, but they are mostly post-pneumonic.

DR. P. E. MELTZER: It would appear that the ratio of cases in children between the ages of 4 and 10 years to cases in adults is 10:1.

CASE OF BRANCHIAL FISTULA. DR. M. NOYES KLEINERT and DR. F. E. GARLAND.

A young boy had a discharging sinus located on the left side of the neck along the anterior portion of the sternocleidomastoid. The internal opening of the sinus appeared at about the center of the left tonsil. Injection of gentian-violet into the external opening caused the dye to appear at the point in the tonsil mentioned. Dr. Kleinert removed the tonsils first without any difficulty, but could not demonstrate a fistulous opening into the lateral pharyngeal wall. The second operation was performed by Dr. F. E. Garland who made an incision around the external opening. The tract was then dissected up as far as possible into the neck. A probe previously passed through the external opening could not be made to appear through the throat; gentian-violet could be passed through, however. Several attempts were made to find the fistulous opening directly into the throat by placing the fingers in the mouth; however, the tip of the probe could be felt easily. The fistulous tract was then tied off as near as possible to the pharynx, and the wound in the neck was closed. A rubber drain was then inserted.

DISCUSSION

DR. F. E. GARLAND: The only reason that I did not follow the tract into the pharynx was that I was fearful that the sutures might break down, and in the act of swallowing the patient might force food into the wound, resulting in infection and possibly fistula. The tract passed in front of the sternocleidomastoid, anterior to the great vessels, and then underneath the posterior belly of the digastric.

CASE OF BRANCHIOGENOUS FISTULA. DR. F. E. GARLAND.

This is the second case of branchial cyst that has been seen in this service. The patient, a boy, was operated on two days before presentation. The history is that seven years before, he first noticed a painless swelling on the right side of the neck just lateral to the thyroid gland. He was operated on and had no trouble until 1930, when pus appeared in the side of the previous wound. It healed up shortly after. It broke down again a few days before the present admission. It was impossible to get a dye to penetrate the fistulous tract. The tract was dissected; as in the previous case, it extended toward the tonsillar fossa in front of the great vessels, passing beneath the posterior belly of the digastric. In this case also I did not make an opening into the pharynx for fear of producing an infection.

CARCINOMA OF THE NECK INVOLVING THE LARYNX. DR. C. F. WRIGHT and DR. LEROY SCHALL.

A man, aged 41, was first admitted on February 25, with a history of hoarseness for several months. For one month previous to admission he had had difficulty in breathing. Under local anesthesia a tracheotomy was performed. At that time it was noted that he had a rather diffuse irregular mass involving the whole interior of the larynx. There was edema of the true and false cords. Biopsy at this time was reported as showing chronic inflammation. The patient got along with a no. 5 tube for some time, but later had respiratory distress and was readmitted to the hospital for the substitution of a larger tube. A few days later, Dr. Schall performed a laryngoscopy to determine the extension of the growth. There did not seem to be any extension of the mass downward toward the tracheal wound. Another specimen taken at this time was reported as showing carcinoma, type II.

DISCUSSION

DR. H. P. MOSHER: Is the patient not a candidate for laryngectomy?

DR. L. SCHALL: My opinion is that the mass is a deep carcinoma of the neck with secondary involvement of the larynx rather than a primary growth of the larynx itself. The first specimen taken from the outcropping in the larynx in the previous service was reported as showing chronic inflammation. My intention is to turn the patient over to the tumor clinic for deep roentgenotherapy, as in my opinion operation is not possible.

CASE OF ACUTE MASTOIDITIS WITH MENINGITIS. DR. M. G. EVANS.

A young woman was admitted to the hospital on April 27 for observation. She had an acute left otitis media of two week's duration. She was in the hospital four days when a simple mastoidectomy was decided on. A very large mastoid of the diploetic type was found. Three days later, the temperature rose to 103 F., and the patient complained of increasing pain in the left ear. A mixed nystagmus developed. A lumbar puncture was performed; the cell count was 5,000; the fluid was very cloudy, and other signs of meningitis were present, such as a stiff neck. The jugular vein was ligated. Ligatures were passed around the left common carotid, but they were not tied. On opening the lateral sinus and the mastoid cavity, free bleeding was obtained, though not as free from the torcular end as from below. The following day the common carotid on the right side was dissected free, and 5 cc. of Pregl's solution was injected into each carotid. The same afternoon the patient was given antiscarlet fever serum, which was followed by a severe reaction. Her temperature rose to 107 F. At the time of this report it has been three weeks since this work was done, and she has been convalescing satisfactorily. The cell count of the spinal fluid has come down from 5,000 cells to normal, and the fluid is clear. The temperature is normal and there are no neurologic signs.

DISCUSSION

DR. C. T. PORTER: This is the first case of streptococcus meningitis in which we have given Pregl's solution, and the patient is evidently well. There are no symptoms of any kind. There was little reaction from Pregl's solution, but there was a severe reaction following the scarlet fever toxin, which was given intravenously. Three injections of Pregl's solution, each of 5 cc., were given on consecutive days.

DR. L. SCHALL: As a matter of policy I should like to ask whether or not we should give the injections of Pregl's solution early, before cultures of the spinal fluid have been reported on. Some think that we should wait until we have positive cultures.

DR. FRED BOGAN: I think that if one is going to get anywhere, one should know what germ is present. There were no organisms found in the first specimen

of spinal fluid; the following morning, however, there was a report on the culture, and the day that the organisms were found, we gave Pregl's solution. I believe that one must wait until one knows the type of organism in the spinal fluid.

DR. C. T. PORTER: In that case, as far as treatment is concerned, we wait twenty-four hours. It seems that in the treatment for meningitis, treatment must be instituted early if one has any hope of recovery. If all the signs of meningitis are present, it seems to me that one should give the initial dose without waiting for the report.

DR. M. G. EVANS: Why not make an injection into the carotid arteries without cutting down on them.

DR. L. SCHALL: I do not like to do it. Often there is a large vein overlying the smaller carotid.

DR. G. B. FRED: A few years ago we had several patients with streptococcus meningitis who got well without anything being done other than lumbar puncture.

CASE OF LARYNGECTOMY. DR. LEROY SCHALL.

I am reporting my second total laryngectomy under avertin anesthesia in this service. The patient, 68 years old, gave a history of hoarseness for six months. There were practically no signs or symptoms. I used avertin plus procaine hydrochloride anesthesia, and the results were very satisfactory.

DISCUSSION

DR. H. P. MOSHER: Was it a dry operation?

DR. L. SCHALL: It was not a bloodless operation, but there was less bleeding than when I used avertin plus ether.

DR. H. TOBEY: Was this a two-stage operation?

DR. L. SCHALL: It was a two-stage operation. Five days ago, a preliminary tracheotomy was done. At this operation I dissected the trachea from below upward. I packed off the trachea carefully above the tracheotomy tube, and did not get any blood into the trachea.

DR. C. T. PORTER: How did you treat the stump of the trachea?

DR. L. SCHALL: It was left in situ. I left no dissection. I did not handle the trachea at all, and I was careful not to dissect the tissues away from its walls.

CASE OF ACOUSTIC NEUROMA. DR. G. E. SHAMBAUGH, JR.

A man, 56 years of age, first came to the hospital one year before this meeting, complaining of increasing deafness for two years in the right ear. He had no trouble with the left ear. Tinnitus was present which was described as the sound of "rushing water." There was evidence of nerve deafness in the right ear. A month before this report, the patient appeared at the outpatient department because of unsteadiness of gait. He did not fall in any one direction; he simply had vertigo. These symptoms were of about six months' duration. There was no reaction on the right side in the caloric test; there was a normal reaction on the left side. There was beginning facial weakness on the right side. The patient was referred to the neurologic service where a diagnosis of probable tumor involving the eighth nerve on the right side was made.

DISCUSSION

DR. H. P. MOSHER: What is the response of the canals on the left side?

DR. G. E. SHAMBAUGH, JR.: They respond perfectly well. I neglected to mention that the patient has a peculiar sensation of numbness on the right side of the face; probably the fifth nerve has become involved as well.

DR. H. P. CAHILL: It is an interesting case, probably one of early acoustic neuroma. The lesion evidently has not caused enough compression to interfere with the superior canal of the opposite side. This takes place in quite a few of the cases.

CASE OF MASTOIDITIS WITH LATERAL SINUS COMPLICATION. DR. PHILIP MYSEL and DR. F. BOGAN.

A boy, 9 years old, was admitted to the emergency ward of the Massachusetts General Hospital with the diagnosis of an infection of the upper respiratory tract with suppurative otitis media. Five days after admission he was seen in consultation in the ear service. There was nothing significant about the case other than a pulsating discharge with elevation of temperature. The blood culture, however, was positive, showing Streptococcus hemolyticus. The following day there was pain in the left hip joint. The patient was transferred to the Eye and Ear Infirmary where a left simple mastoidectomy was done; the jugular vein was ligated and the lateral sinus incised. At operation the cells were found intact, but pus was present in the cells under tension. The temperature still continued to be septic. The patient was given a transfusion. He is being treated with scarlet fever antitoxin at intervals of three or four days. The orthopedic department aspirated the joint, but found nothing. We are now planning to give intravenous injections of mercurochrome-220 soluble.

DISCUSSION

DR. H. P. MOSHER: If that does not work, what is the next step?

DR. P. MYSEL: The next procedure would be to open the sinus and see whether the newly formed clot has become infected again.

DR. G. TOBEY: May not the temperature be the result of the infection of the hip?

DR. P. MYSEL: It may well be from the hip. It is difficult to distinguish between local sepsis of the hip and sepsis that is the result of infection of the lateral sinus.

CASE OF MASTOIDITIS WITH LATERAL SINUS COMPLICATION. DR. G. B. FRED and DR. F. BOGAN.

A 14 year old girl was admitted to the hospital with the history of a discharge from the right ear of three months' duration. There was also a history of headache, dizziness and some vomiting at the time of admission. Roentgenograms showed sclerosis of the right mastoid. She also had a markedly infected sinus on admission, and we were undecided whether her sinus or her ears were responsible for the symptoms, since there was no tenderness over the mastoid and the discharge from the ears appeared of the same character as that from the nose. A right simple mastoidectomy was done. The bone was partially sclerosed, and considerable pus was present. The lateral sinus was exposed and incised. It contained a firm clot which was infected. There was no bleeding from the bulbar end, and little bleeding from the torcular end. Several days after the operation the patient continued to have headaches with projectile vomiting. The reason that the jugular vein was tied after rather than before removal of the clot from the sinus was that the jugular compression or Tobey Ayer test failed to show blocking, and the involvement of the lateral sinus was found during the course of the mastoid operation. Five days after the first operation intradural complications were suspected because of the continued vomiting and headaches. The dura over the posterior and middle fossae was exposed and found to be normal. The lateral sinus was followed back about an inch toward the torcular end, and a firm clot was removed until free bleeding was obtained. Since the last operation the patient has had very little fever. It is not definitely known whether this operation

has relieved her permanently. The patient does not look quite normal, and I question whether removal of the second clot was advisable. There was no evidence of meningitis in lumbar puncture. The fundi are normal.

DISCUSSION

DR. G. TOBEY: I consider the procedure in removing the second clot satisfactory.

DR. F. BOGAN: In a case similar to this an operation was performed about two weeks ago. A large secondary clot was removed until free bleeding was obtained. The patient, a girl, is now well.

DR. H. P. CAHILL: I have not yet quite made up my mind as to what to do to the upper end of the clot. The question is not yet settled by clinicians. I would advise you to watch carefully for involvement of the fifth or sixth nerve.

DR. H. P. MOSHER: Dr. Eagleton frequently remarked that in any case with vomiting one should think of intracranial disease.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Meeting, Nov. 2, 1931

HOWARD C. BALLENGER, M.D., *President, in the Chair*

CARCINOMA OF THE LARYNX. DR. ALFRED LEWY.

The patient had a squamous cell carcinoma involving both sides of the larynx, but intrinsic. A laryngectomy was done under avertin, supplemented by local anesthesia, which was successful, except for severe paroxysms of coughing during the separation of the larynx from the esophagus, which could not be controlled by local applications of cocaine. The esophagus was button-holed during the dissection. This was repaired, and healing was uneventful.

The important thing about this case was that, after healing was complete, the patient was referred to Dr. Leo Kallen for training in the esophageal voice. Dr. Kallen will discuss that phase. The man has made remarkable progress in eight weeks of training.

REHABILITATION OF THE VOICE IN LARYNGECTOMIZED PATIENTS. DR. M. REESE GUTTMAN.

Two men, aged 52 and 58, were operated on by Dr. Beck and me, one of them three and a half years ago. In both the throat is entirely healed, and apparently there has been no recurrence of the malignant condition. These patients are shown in order to demonstrate a few points that might be of interest in regard to voice production after the larynx has been removed. As is well known, a large number of artificial larynges have been made, but unfortunately many patients are either unwilling or unable to learn to use them properly.

As far as the artificial larynges themselves are concerned, and aside from the fact that most patients do not take kindly to them, there comes in the question of their adequacy. None of the artificial larynges that we have tried has been very successful. In the Mackenty type, the vibrating rubber gets wet from the tracheal secretions and refuses to function. In the McKesson type, there is a great deal of difficulty in the proper adjustment of the vibrating reed. This adjustment fails every little while, and the patients also have a great deal of difficulty in learning to use the instrument. Like patients that have lost other members of the body, such as the nose or ear, they would rather have some substance that comes

from themselves than one of foreign nature. It is a well known fact that a patient without a nose or ear would rather have one built up of his own tissue than wear any of the artificial prostheses that are being made for this purpose, and apparently the same peculiar psychologic outlook exists in laryngectomized patients. As a rule, they do not take kindly to the artificial larynx.

This brings one to the question of reeducation of the voice. This has been found to be the most satisfactory method, but here, too, difficulties are met. Roughly, patients can be divided into two classes, those that will talk and those that will not. Those that will talk apparently have the anatomic parts that are necessary to carry on conversation; by that is meant that they are able to swallow air into the esophagus and then belch it forth. They also have a well functioning cricopharyngeus, which apparently acts as a vicarious larynx. The tone produced by the air being expelled from the esophagus past the partially approximated cricopharyngeus can then be modulated by the tongue, palate and lips into fairly audible speech. In fact, a few cases of this kind have been reported in which the patient not only is able to speak, but can be made to sing. This one man, as you can now hear, has a fairly competent voice that is audible over a fair distance. He has taught himself, as he has the requisites of underlying anatomy in order to be able to produce tone. If this man had been under the care of an instructor in speech he would probably have made a great deal faster progress. He is fairly representative of the type that has a fair voice.

The other patient, in whom laryngectomy was performed four and one-half years ago, cannot be induced to talk. Even under instruction he has been unable to learn, and a careful résumé of the case will give some idea as to why this is so. In the first place, a review of the operation will disclose that we resected the upper portion of the esophagus, including the cricopharyngeus, and if you will examine him you will notice that the esophageal introitus is wide open and relaxed and is filled with a frothy fluid that collects in the esophagus. This man is unable to approximate the walls of the esophagus in order to form a vicarious larynx, owing to the fact that the cricopharyngeus muscle was removed at the time of the operation. For that reason this type of larynx cannot be produced. However, one might produce a vicarious larynx by the use of the back of the tongue against the posterior pharyngeal wall or by the use of the palatal arches or of the palate itself. Another factor may be present in this case, namely, this man's helpless attitude toward life. Apparently he does not wish to learn to talk.

A third patient, who is not present this evening, has a decidedly good voice. He is able to make himself heard across the extent of this room, and he produced this voice in a very peculiar way. He performed an operation on himself. He studied his condition, and one day went to the trouble of heating an ice pick and passing it from the fistula of the trachea in the neck up through the hypopharynx toward the base of the tongue. As a result, a small fistula occurred, and he is now able to place his thumb over the tracheal opening in the neck and then force air from his lungs along this small fistula back into the mouth. The air passing through this very narrow track forms a tone, which is then modulated in the pharynx and mouth in order to produce speech. Taking this remarkable example as a clue, Dr. Beck and I have evolved an operation by which a needle is connected to a diathermy apparatus and is passed from the tracheal opening into the neck through the hypopharynx to the back of the tongue, staying well in the midline and coagulating a small track which later will fistulate. This becomes lined with epithelium and remains more or less patent, and by placing the thumb over the tracheal opening into the neck, the patient is able to force air along this fistulous track and produce a tone that can be modulated into voice production.

DISCUSSION OF VOCAL MECHANISM IN THE LARYNGECTOMIZED PATIENT. DR. LEO KALLEN.

In the case just presented to you by Dr. Lewy, the throat was, I am sure, by a happy circumstance, so prepared surgically as to offer anatomic conditions properly suited for the development of a so-called "esophageal voice." This

patient came to me less than two months ago, and by diligent effort and intelligent application has already attained sufficient mastery over the mechanism involved to be able to engage in a fair degree of comprehensive conversation. In order to make more clear the manner in which the esophageal voice mechanism works, I shall reiterate a few fundamental principles more or less familiar to all of you.

The normal production of voice and speech depends on a coordinated mechanism consisting of three chief factors, viz., the lungs, the larynx and the articulation musculature. The manner of their control by the central apparatus does not concern us here. The sound engendered by the expiratory current of breath at the level of the vocal cords as they are thrown into vibration by it undergoes all sorts of modification in the parts superposed on the larynx, namely, the resonance cavities of the pharynx, mouth and nose. Quick, agile variations in the shape and size of this resonator, as it might be called, give rise to the formation of the various consonantic and vowel values that one synthesizes into meaning and calls language. For a proper effect in speech, the coordinate function of the lungs, larynx and articulation apparatus must be executed flawlessly. That the slightest disturbance in any one of the three interferes with such an effect is a matter of daily experience.

Now, what are the conditions in the laryngectomized person? Not only is the vocal apparatus gone, but obviously the bellows function of the lungs is no longer present, a disconnection between the upper and lower respiratory tracts having been effected by the operation. Thus the lungs can no longer function for phonic respiration. In the laryngectomized person, respiration is reduced to vital function only. All that remains of the speech function complex is the articulation factor, if it has not been involved in the disease process and has been left intact by the operation.

It is thus clear that vocal therapeutic measures in laryngectomized persons aim at the development and the ultimate establishment of a vicarious reservoir for air that may be subjected to compression in order that some anatomic structure capable of functioning as a vicarious glottis may be activated by it.

The problem, therefore, revolves around the location of the anatomic structures offering possibilities for the development of a vicarious reservoir for breath, a vicarious "air-chamber" as it might be called. It is reasonable to assume that the source of phonic breath must occur within a space closed off on all sides, in order to make possible the compression of such breath, which will then escape at a point of least resistance, namely, at the point where the vicarious glottis has been formed. Were this space not so closed off, the compression of its gaseous content would be impossible, and, as a consequence, the formation of a vicarious glottis could not take place. One of the first steps in vocal gymnastic therapy is the accumulation of air within such a space in as great quantity as is possible. It is obvious that the only possible location for the occurrence of such a space is somewhere in the upper alimentary tract between the levels of the mouth and the stomach.

As for the location of the vicarious glottis, there are many anatomic structures that can well serve the purpose. Any structure or structures capable of forming a closure or a narrow slit that can be thrown into vibration by compression and propulsion of air from below will do. Thus the dorsum of the tongue and the tensed velum palatini, the base of the tongue and the posterior wall of the pharynx, the two posterior pillars of the fauces, the inferior constrictor of the pharynx, the epiglottis and the two lateral pharyngeal bands, and lastly, but in my opinion most important, the cricopharyngeus muscle, alone or in combination as the case may be, may all develop into vicarious glottides. The development of one in preference to another depends on several factors, such as the location of the vicarious air chamber, the new anatomic relations as established by the operation and individual architectonic variations.

Before going more fully into the mechanism of the esophageal voice as exhibited by the case under discussion, I should like to say a few words about the two laryngectomized patients presented by Dr. Guttman. He has shown you one patient in whom speech developed spontaneously some time after the operation,

which was performed two and a half years ago. The acoustic qualities of the voice in this case are typical of a pharyngeal mechanism, the pseudoglottis being somewhere in the pharynx and activated by a source of air from below. During the process of speech one can see the patient execute all sorts of oral and pharyngeal movements, but chiefly one in which he appears to be sipping in air. The cavity caused by the extirpation of the larynx and the hypopharynx is thus filled with air. This air, compressed by means of the muscular contraction of the parts that contain it, is expelled in such a way that it is directed toward and forced through a point of least resistance formed by a narrowing somewhere in the articulation apparatus above it that is sufficient to cause the production of sound. Frequently this is the manner in which a "pseudovoice" is developed and maintained. After utilization of the air, its renewal is accomplished by the relaxation of those parts that contracted for its compression, the air rushing in as the result of negative pressure, as it does into any cavity that suddenly becomes larger. This inrush of air is equivalent to phonic inspiration. In addition, other movements are necessary, such as swallowing and sipping. All the details of this process are easily followed, for the inflation and collapse of the air chamber defines itself clearly. Occasionally one sees a case (I have observed such a one recently) in which the upper part of the esophagus is involved in the function of an air chamber along with the cavity in the hypopharynx. In a great number of cases, on the other hand, the esophagus alone functions for that purpose, the whole act of phonation being enacted within it, which brings one directly back to Dr. Lewy's case. The act of speech in this case is ushered in by contractions of the esophagus that begin at the lower end of approximately its upper third, or even a bit lower, progressing proximally in a spiral or serpentine manner, as was first graphically demonstrated by Seemann. At the beginning of the therapy, this patient effected the opening of the esophagus in a very explosive manner, but now that he has had a little practice, the whole process proceeds much more slowly and more purposefully, making it possible for much more air to reach the esophagus. In order to understand this mechanism clearly, a brief description of an interesting phenomenon occurring in the esophagus and associated with the act of phonation is necessary. The dominant pressure within the esophagus is always negative, except under conditions of forced expiratory activity, such as may occur during screaming, coughing, etc. Motor manifestations may be observed in the esophagus during vicarious phonation. They are represented by synergic contractions consisting of a greater or less degree of tight, corset-like constriction of the esophageal lumen in the region of the esophageal mouth and hiatus. These constrictions are chiefly in the horizontal plane and represent genuine changes of an active nature that are to be construed as physiologic in character. This phenomenon evidently occurs where there is transverse striped musculature, receiving impulses conducted along fibers given off by the vagus and the superior laryngeal and recurrent nerves.

These are genuinely active movements intrinsic to the esophagus and not incident to movements of respiration. The fact that the recurrent laryngeal nerves give off branches, some of which, the so-called esophageal branches of the recurrent nerve, are distributed to the esophagus as well as the larynx, makes this supposition plausible, and is one of the important reasons why the cricopharyngeus muscle should be preserved as much as possible during the operation. It is thus not unreasonable to suppose that this phonation phenomenon is a physiologic process which, normally represented by a latent potentiality, is stimulated to active kinesis in the cases in which the larynx is wanting. In some cases in which the esophagus is the vicarious air chamber, these contractions exert their force for the purpose of compressing the air, while in other cases the constriction that they cause can well be utilized as a vicarious glottis, when the source of air occurs below it. It is thus clear that the anatomic and physiologic conditions of the esophagus meet perfectly the requirements for the production and development of a vicarious voice. The laryngectomized subject has to learn effective aspiration of air into the esophagus, which ordinarily contains a negative pressure, by means

of conscious sensibilities located in the parts involved. In the beginning the process is accompanied by a belchlike sound that is caused by the friction of the air current and the dishesion of the esophageal walls. The moment the aspiration sound occurs, tension of the oral floor can be felt, while the region of the larynx executes a jerklike movement upward and forward through the contraction of the thyrohyoid muscles. The force represented by this upward and forward pull is simultaneously distributed to the cricopharyngeus muscle, which forms the anatomic substratum of the esophageal orifice. This is the manner in which the tonic closure of this muscle is relaxed. Simultaneous with the described movement, a quick, short inspiration, effected by the execution of a jerklike contraction of the diaphragm, causes an inrush of air into the esophageal vacuum with the production of the described acoustic effect. The striking point about this case, however, is that not only can the subject speak during the expiratory phase of this vicarious phonic respiration, but he has been taught to transform the sound engendered by the act of aspiration into articulate value as well. He is thus able to articulate the aspirate sound and the sound incident to the process of expulsion. This in time will produce a remarkable degree of fluency. The only other case of a "two-way" speech, so to speak, reported in the literature, is one described by Emil Fröschels many years ago. In his case, however, the mechanism developed spontaneously.

Just a word in regard to Dr. Guttman's second case. It is obvious that this patient has no tonal voice. His manner of speech is represented by a confluence of oral postures, some of which effect the pronunciation of voiceless consonants, but no other sounds. Such a process is referred to as "pseudowhispered" speech. This, however, is a misnomer, for the act of whispering depends on the larynx fully as much as does tonal voice, the normal whisper being due to friction of the expired breath through a partially open glottis. The effect of whispering in this laryngectomized subject results from a compression of air contained within the oral cavity when articulation functions for the production of nonvocal consonants of explosive or fricative character of short duration. There is no pseudoglottis in these cases. The vowel, which is always sustained, is represented merely by the oral posture involved, since there is no source of air for its sustenance. This patient furnishes a wonderful example of phonetic neglect after operation. There is no doubt that he could have developed a voice with the proper training and instruction. Yet five years after the operation he is not adjusted to the new conditions as he should be. This manner of speech occurs spontaneously soon after the operation, and although more or less audible, is under the most favorable circumstances comprehensible only when the listener is at the peak of attention or at very close range. A patient who becomes habituated to the pseudowhispered voice has established a condition that makes the further mastery of laryngeal speech by the vocal method extremely difficult. He gets conditioned to the pseudowhispered voice even by a short period of practice and finds himself confronted with great obstacles at the beginning of vocal gymnastic therapy, the new mechanism gaining a foothold only very poorly or not at all. It is thus of the utmost importance that the patient, after successful operation, be warned most vehemently against the danger of resorting to this manner of communication, and that he be urged to make every effort to avoid it. It is far better for him to communicate with pencil and paper than by this means until vocal gymnastic therapy is undertaken.

In closing, I should like to stress emphatically the necessity for the surgeon to be interested in preparing the patient as favorably as possible for the phonetician. This should be an important factor in his technic. He should spare as much tissue as is safely possible. In his desire to be absolutely sure he often removes demonstrably sound tissue, such as muscular tags, folds of mucous membrane, etc. The removal of such tissue should be limited to cases in which doubt as to the health of the tissue makes it imperative. Every fold of mucous membrane, every favorably placed cicatricial band, every muscular remnant, may serve as the basis for the development of a pseudoglottis. What they are or

where they should be placed cannot be said in advance. The vicarious expiratory current of breath selects, on the physical principle of efficiency and mechanical advantage, that structure that in resistance to it will best supply the mechanical principles involved — in other words, that structure making most possible the maximal production of useful sound with the minimal application of force. In this way, many a striking case of pseudovoice owes its development to the happy hand of the surgeon. The question thus arises as to the possibility of surgical predetermination and insertion of a pseudoglottis. It has been suggested that the transplantation of two folds of mucous membrane or muscular strips in the mesopharynx or hypopharynx might serve as the structure that later develops into the pseudoglottis. The position or direction of these elements is not a matter of importance. What counts is their ability to vibrate. Only long experience and eternal vigilance along these lines can teach ultimately how to improve and perfect the formation of a pseudoglottis. The cricopharyngeus, above all, must be spared. The integrity of its innervation must be preserved to the greatest possible extent. Protection of the sternohyoid and thyrohyoid muscles is also important, for these muscles pull the laryngeal region upward and forward, lifting it away from the posterior wall of the pharynx, whereby the tonic closure of the cricopharyngeus is relaxed, an important factor in the training of esophageal speech. As a final surgical prerequisite from a phonetic point of view, these muscles should be sewed to the anterior wall of the pharynx approximately at the level of the mouth of the esophagus, for the facilitation of the mechanism of aspiration.

CARCINOMA OF THE THROAT. DR. ROBERT SONNENSCHEIN and DR. SAMUEL J. PEARLMAN.

A physician, aged 58, was first seen on May 7, 1931. He complained of periodic hoarseness for the past twenty years. The last attack had occurred during the past five months and was associated with some discomfort in speaking and swallowing, but no cough. The Wassermann reaction one week before had been negative.

Examination of the pharynx showed flat, submerged tonsils with caseopurulent material in the crypts. The vocal cords moved freely, but a mass was seen involving the anterior three fourths of the left cord. No glands were palpable in the neck.

A roentgenogram of the chest, on May 11, 1931 (Brams), revealed tuberculous infiltration of the apex of the left lung, a calcified nodule of the apex of the right lung and bilateral inactive tuberculosis.

After biopsy, performed at Michael Reese Hospital on May 19, 1931, the condition was reported to be squamous cell carcinoma of the left cord.

On May 19, 1931, under cocaine anesthesia, with the Hasslinger forceps, tissue was removed from the left cord.

On May 27, 1931, under amytal-morphine anesthesia, with blocking by procaine hydrochloride, an incision was made from the thyroid to the sternum. The second and third tracheal rings were cut, and a large tube was inserted. The thyroid was split to the right of the median line. The left wing was resected subperichondrially, and the left membranous larynx was removed beyond the tumor tissue. A few arm silk sutures were inserted and gauze dressings applied.

The second patient, Mr. H. P. H., aged 61, was seen on May 3, 1929. He complained of hoarseness for eight months and of some pain in the left side of the neck. There was no dysphagia. He had consulted Dr. Mackenty in New York, who made a diagnosis of carcinoma of the larynx.

Examination showed that the nasal septum deviated to the right. The tonsils were flat and inflamed. The right cord was polypoidal in the anterior two-thirds. The left cord was discolored, with an uneven edge, but moved freely. There was a rounded, tumor-like swelling of the left false cord, and a small gland could be palpated over the lower part of the trachea.

On June 17, 1929, under cocaine infiltration, a median incision was made from above the hyoid to the lower part of the trachea. The hyoid was cut with forceps,

the muscle separated and the trachea exposed. Packing was placed below, and the skin was closed with silk down to the packed area.

On June 21, under cocaine anesthesia, the upper tracheal rings were incised and a tube inserted.

On June 24, under morphine-scopolamine, cocaine and procaine hydrochloride anesthesia, thyrotomy was performed, with diathermy applied to the tumor tissue on the left side. The tube was removed about July 24.

On August 2, the left side of the larynx appeared smooth, the voice was fair, and the wound in the neck was healed.

On March 11, 1930, the left false cord was large, but smooth.

Carcinoma of the Antrum. T. C. Galloway.

For the treatment of carcinomatous lesions of the antrum it seems to have been shown that nothing is so successful as surgical diathermy. My three patients were presented in order to demonstrate the excellent healing that occurs with a relatively small amount of mutilation.

The first patient had a lesion the size of a lemon that involved the wall of the nose and the upper lip and extended into the antrum. It was reported as an epidermoid carcinoma. He also had four small typical basal cell carcinomas, the identity of which was proved by biopsy, in the adjacent atrophic area. These lesions were destroyed by the superficial desiccating current and the large lesion by electrocoagulation. The case is now one year old and plastic repair, by means of the pedicled flap shown, is under way by Dr. Joseph Schaeffer.

The second patient had a lesion that involved the naso-antral wall and the inferior and middle turbinates, extending into the mouth and affecting the orbit and the ethmoids and filling completely the maxillary sinus. We penetrated the skin and destroyed the lesion and overlying tissues. I think that one should use the external approach in all such cases, in order to see the growth and to destroy it completely. If one tries to carry out a cosmetic technic satisfactory results will often not be obtained. This patient has a large defect remaining from the operation, but it is smooth and completely healed. If a local recurrence appears in such a lesion it can be detected by biopsy within a few weeks. This cannot be done after surgical or radium therapy. The last application of diathermy was made three years ago. The defect in this case has been repaired by Dr. Schaeffer by means of a flap from the shoulder, with splendid results.

The third patient had a lesion over the canine fossa. On lifting the upper lip a rounded swelling could be seen at the buccal angle which extended to the orbit, and there was a smooth rounded swelling through and into the nose. Five biopsies were performed before the laboratory reported that the growth was an epulis and not simple inflammatory tissue. This growth is a rather unusual manifestation of this type of tumor. It was attacked repeatedly by diathermy and with radium and responded well to this treatment.

A woman was struck by a bullet which carried with it the upper left central incisor, ranged the length of the tongue and buried itself against the cervical vertebrae. She was desperately ill when seen three days later and apparently in a state of surgical shock, although the real trouble proved to be dehydration and fusospirochetal infection, which had previously been overlooked because of the emphasis placed on shock. With intravenous injections of dextrose, Ringer's solution and arsenicals, the whole picture changed in twenty-four hours. The bullet was removed under the excellent deep illumination of the Good light. The importance of preventing dehydration is to be emphasized in all cases in which obstruction makes swallowing difficult, notably cases of infection, foreign bodies, malignant conditions and injuries.

Gumma of the Septum. Dr. Samuel Salinger.

A woman, aged 35, was about to have a submucous resection of the septum performed for what appeared to be a deviation of the quadrangular cartilage. On

attempting to inject procaine hydrochloride, I found that the needle entered into what seemed to be a soft cavity. I deferred operation and took a Wassermann test, the result of which was plus four. The patient now has a typical gumma of this region, and antisyphilitic therapy is being carried out.

A few years ago, in a similar case, I was not so suspicious but went ahead with the operation. The result was a large perforation and saddle nose.

ABSCESS IN THE TEMPORAL LOBE. DR. SAMUEL SALINGER.

A boy, aged 5, had a chronic running ear for four years, with acute exacerbations. A few days prior to admission to the hospital, there were a sudden cessation of the discharge, severe headache and projectile vomiting. The temperature was 98.6 F., and the pulse rate 64; the spinal fluid was under pressure, the Pandy test was positive and there were 45 cells. There was bilateral choked disk, more marked on the right side. On the basis of these findings, the mastoid, which was sclerotic, was opened and the antrum was found to be filled with cholesteatoma and granulations. The tegmen was removed, and the dura of the middle fossa was found to be bulging and tense. The fossa was opened, and a brain searcher was introduced upward for about 2 cm., where resistance was encountered. When this point was penetrated there was a gush of foul-smelling pus. The abscess cavity seemed to have a definite capsule and was drained with a rubber tube for about two weeks. During this time irrigations of saline solution and peroxide were employed, alternated with suction.

The boy seems to be perfectly well after two months, although the choked disk is still apparent and there is a slight tendency to paralysis of the external rectus muscle on the opposite side, which has been present since the operation. There are no other symptoms.

In the treatment of these patients, as in other cases of abscess of the brain, it has been found of advantage to have the patient sit up immediately after the operation and keep the head turned away from the side of the lesion. This has a tendency to keep the abscess cavity from collapsing.

I do not think that it makes much difference what method of drainage is employed so long as the drainage is unobstructed. The important fact is that if the abscess is well capsulated and the virulence of the organism well attenuated, the patient has a good chance for recovery.

In all other circumstances, as is generally known, the prognosis is very bad.

CARCINOMA OF THE LARYNX: LARYNGECTOMY. DR. SAMUEL SALINGER.

A man, aged 58, had an extensive carcinoma of the larynx, which was beginning to be extrinsic but nevertheless seemed favorable for operation. A one-stage laryngectomy without preliminary tracheotomy was done. It was found when the neck was opened that the carcinoma had perforated the thyroid cartilage on the right side, that a secondary infection had developed, and that there was an abscess in the region of the perforation extending backward to the posterior border of the cartilage. Despite these unfavorable findings, I went ahead with the operation and removed the larynx with the epiglottis and considerable of the muscle tissue in front of the larynx. The patient made an uneventful recovery, and thus far has shown no signs of recurrence. He is receiving deep roentgen therapy as a prophylactic measure.

The pathologist's report on the specimen was epidermoid carcinoma.

CEREBELLOPONTILE ANGLE LESION SYNDROME. DR. DANIEL B. HAYDEN.

A man, aged 45, was examined in the clinic on Oct. 6, 1931. He stated that he became suddenly deafened in the left ear fifteen months previously, the onset of the deafness being associated with marked dizziness and pulsating tinnitus. For the first three days the dizziness was marked; he noticed that when walking he had a marked tendency to deviate to the left, and he was unable to work. At

no time was there pain in the left ear. There was no history of any previous aural trouble other than recurring attacks of eczema.

When he was examined, the tympanic membranes were found to be normal. The left maxillary sinus was cloudy. This was irrigated, and a small mass of flocculent pus was removed. There had been a submucous resection of the septum nasi, with resulting perforation. The tonsils were completely enucleated. The larynx was normal.

Tests of hearing were made. The Weber test showed that the sound was referred to the right ear; the Schwabach test was negative. The Rinne test on the right was positive, and on the left negative. There was total deafness in the left ear for all tuning forks. There was no spontaneous nystagmus. Spontaneous pointing tests were normal. Rotation to the right ten times in twenty seconds elicited no response. Rotation to the left at the same rate elicited nystagmus normal in direction and amplitude but of shortened duration (ten seconds).

Caloric tests: Tests were made with cold water at 68 F., with the head in the erect position. Stimulation of the right ear for five minutes produced no nystagmus. Tilting the head backward showed a normal response on the left. Pastpointing reactions with either hand showed no deviation to the right or left. Stimulation of the left ear for five minutes with cold water failed to produce any nystagmus or pastpointing.

An audiogram showed hearing to be within normal limits in the right ear. There was total deafness in the left ear for all tones except 1,024 and 2,048 d. v., which were perceived after 80 degrees of amplification, but the patient volunteered the information that they were being heard in the right ear.

The Wassermann reactions of the blood and spinal fluid were negative.

The report of the neurologic examination, briefly, was: "There is no evidence at the present time of any angle tumor."

This, then, is a case of total destruction of the function of the left cochlea and of the horizontal and vertical canals on the left and of the vertical canals of the right side. This is the so-called "cerebellopontile angle lesion syndrome," indicating a lesion, whether exudative, infiltrative or neoplastic, of such a nature as to block afferent impulses of the entire homolateral eighth nerve and afferent impulses of the opposite vertical canal. It is possible, however, that in this patient the labyrinthine responses are the first to be affected, and that later well marked neurologic symptoms will appear.

NASAL POLYP (FIBROMYXOMATOUS). DR. DANIEL B. HAYDEN.

A boy, aged 11, was first seen in June, 1931. He gave a history of nasal obstruction which had been present for the past three years and of severe attacks of epistaxis during that period. Recently he had complained of pain over the left cheek, and his parents had noticed swelling beneath the left eye.

Transillumination showed the right antrum to be clear, the left dark. Roentgenograms made at the Research Hospital showed the left antrum and ethmoid sinus to be dark, the other sinuses clear.

The right nasal passages were perfectly free, the left partially blocked by what appeared to be a large mucous polyp lying on the floor of the nose, filling the inferior meatus and apparently attached to the middle meatus. It was movable, firm and grayish and bled easily on manipulation. A large piece was removed, followed by a profuse hemorrhage.

The microscopic diagnosis was fibromyxomatous polyp of the nose.

In view of this report, further effort was made to remove the entire mass. It was not possible to enclose the entire mass in the loop of the snare, and when it was cut through hemorrhage was so profuse that the nose had to be packed.

The microscopic diagnosis on this piece of tissue was hemangiomatous tissue.

Because of the severe bleeding, 25 mg. of radium was applied in the left nostril for four hours on July 30. This seemed to reduce slightly the size of the mass, and six weeks later a further attempt was made to remove it, but while cocaine

was being applied about the middle meatus such profuse hemorrhage occurred that only tight packing controlled it. On October 23, 12.5 mg. of radium was applied in the left nostril for six hours.

At present the postnasal view shows the tissue completely blocking the left choana and extending into the nasal pharynx, obstructing the view of the left pharyngeal opening of the tuba auditiva. A roentgenogram showed marked clouding of the left maxillary and ethmoidal regions.

The right tympanic membrane is normal. The left shows marked retraction and slight injection of the superior portions. After inflation the tympanic membrane returns to its normal position. The low tones of the whispered voice are heard at 3 meters and the higher tones at 4 meters by both ears. Big C is slightly shortened in each ear by air conduction. There is a shortened positive Rinne reaction in the left ear.

LARYNGOFISSURE. DR. M. REESE GUTTMAN.

A man, aged 58, had a laryngofissure performed for carcinoma of the larynx by Dr. Beck and me five and a half years ago. He is presented to show some of the vagaries that a malignant growth may, at times, exhibit. When first seen in 1925, he complained of hoarseness, and examination of the larynx showed a small growth on the vocal cord. There were no palpable glands in the neck. The small size of the lesion and its situation within the larynx made us consider the case suitable for laryngofissure, which was performed. The cord was removed; the patient recovered rapidly and was discharged from the hospital. Unfortunately, the wound in the neck refused to heal, owing to the fact that prolific granulations continued to form in spite of all measures. After a number of weeks had passed a biopsy was made on the granulations in the neck, and the report was that it was squamous cell carcinoma. The patient was then advised to have a laryngectomy, but he refused and instead went to the Mayo Clinic. There, also, laryngectomy was advised, and he again refused and returned to Chicago, where he was under our care for a very short time. He then disappeared from observation, and when next heard of he was under Dr. Pearlman's care at the Michael Reese Dispensary. A few months later he appeared in the office with the entire larynx and cervical wound healed.

It appeared that Dr. Pearlman did nothing for him except to observe him and have the wound dressed. Much to our surprise, the lesion has remained well during this period of five and a half years. There has been no evidence of recurrence. The intralaryngeal picture shows a smooth fibrous mass at the site of the original vocal cord. We have performed biopsies on this growth on three different occasions, the last one being about four weeks ago, and in each case the results have been negative.

Apparently this is another case of spontaneous cure or regression of a malignant growth.

RADIOSENSITIVE MALIGNANT GROWTHS ABOUT THE ORAL PHARYNX. DR. M. REESE GUTTMAN.

A man, aged 62, was first seen about eighteen months ago complaining of pain on deglutition. Examination at that time revealed a small neoplasm about the size of a walnut at the base of the tongue and apparently also invading the tonsil. Biopsy was performed, and the report was transitional cell epithelioma. The patient was treated by the insertion of radon seeds, and within three weeks the lesion disappeared. There has been no recurrence for the past eighteen months.

The second patient was first seen about fourteen months ago. He was referred by his family physician, who found a tumor the size of a cherry at the base of the right tonsil. This tumor was removed, and histologic examination showed it to be a lymphosarcoma. Under irradiation the base of the lesion, from which a biopsy specimen had been taken and which was also shown to be a lymphosarcoma, healed and apparently has remained well to the present time.

These two interesting cases bring to mind a third case that was seen by us about six weeks ago. The patient had a large mass in back of the nose, which had been present for about four months. He also exhibited large glands in the neck. Biopsy showed the growth to be a lympho-epithelioma. Knowing the highly radiosensitive nature of this lesion, radon seeds were distributed throughout the nasopharyngeal mass, and deep therapy was given to the gland in the neck. Within a week all evidences of the tumor within the nasopharynx and the gland in the neck had disappeared. Just what the outcome will be is, of course, as yet problematical.

A great deal is being learned at the present time from histologic investigation by the workers who are interested in radium. It is due to their efforts that one has been able to isolate such clinical entities as lympho-epithelioma, the transitional cell epithelioma and Ewing's endothelial myeloma.

These three types of lesions are highly radiosensitive, and they respond to even small doses of radium or deep roentgen therapy. However, radiosensitivity must not be mistaken for curability. It is peculiar that these lesions are highly malignant, and that they rapidly metastasize and cause death. Although they may respond promptly and dramatically to doses of radium or roentgen rays, yet the prognosis, owing to the fact that metastases are early and widespread, is, as a rule, poor.

FOREIGN BODY IN THE RIGHT BRONCHUS. DR. EDWIN MCGINNIS.

CASE 1.—A patient seen within the past few months had inhaled an ornamental glass jewel, which had lodged in the right bronchus. This ornament was facetted; and the dimensions were about one fourth by three fourths of an inch, and it was one fourth of an inch (0.64 cm.) thick. It was rather ovoid in contour and was hard to hold with the ordinary grasping forceps. I finally had to put in as large a tube as the larynx would carry so as to get a sufficiently strong forceps down to it. This forceps had some fine teeth on both blades, and with it I was able to get a firm hold on the object. Removal was accomplished, and the patient made an uneventful recovery.

CASE 2.—A boy, aged 3 years, playing on the beach, suddenly had a coughing spell. A roentgenogram showed a faint shadow in the right bronchus, and the breath sounds on the right side were reduced. When the child was on the operating table, however, the object was found in the left main bronchus. When this object was removed it was found to be a small smooth pebble. The only forceps that would hold it was a basket-shaped one patterned after the Bruening type.

CASE 3.—A boy, aged 4, had an open safety-pin in the right bronchus. This pin had been in place for about ten days and one attempt at removal had been made, which was unsuccessful. I was unable to close the pin, but got it out through the tube by grasping the guard. The child made an uneventful recovery.

CASE 4.—A 2 year old child had inhaled a kernel of corn, which was located in the lower end of the trachea. He had been taken to a local hospital, and an attempt at removal had failed. He was then brought to Chicago, and I saw him the following day. The resident on the pediatric service and my own intern, after examination of the chest, said that there was nothing in the air passages. When the child was asked to cough, one could hear the object moving up and down in the trachea. I removed this object, which proved to be a kernel of yellow dent corn, in less than a minute. I instructed the intern on duty to call me immediately if the child showed any untoward symptoms during the night, but unfortunately this was not done, and the child died early the next morning. On investigation I found that he had had a little difficulty in breathing, and that the resident decided to employ intubation. Unfortunately, he had not had much experience; the patient immediately became cyanotic, and even though an emergency tracheotomy was done he died. Postmortem examination was not made,

so that we have to guess why the patient died. One supposition is that pneumonia may have developed, and another is that the thick tracheobronchial secretions may have caused death by drowning.

I am always a little on the qui vive when there is vegetable material in the tracheobronchial tree.

AUTOTYMPANOSCOPY. DR. AUSTIN A. HAYDEN.

It is sometimes of interest for a patient to see his own ear drum, and he can easily do this if an ordinary ear speculum is used with a mirror on the back of it. A second mirror makes it quite easy to see around the corner if the mirror is properly angulated, and the patient can thus see his own ear drum. This is particularly valuable in the presence of perforated ear drums, for it makes the patients realize that they should not put water in the ear, and it also has some influence on the proper toilet of the ears. I have given this procedure the name of autotympanoscopy, and shall be glad to demonstrate it to any who are interested.

LARYNGECTOMY FOR CARCINOMA. DR. HARRY L. POLLOCK.

A man, aged 62, had a laryngectomy performed fifteen months ago. He had a history of hoarseness of five years' duration and had been treated by his family physician until two weeks before I saw him. I operated in August, 1930; he made an uneventful recovery and remained well for twelve months, when difficulty in swallowing developed. There was always some induration on the right side of the wound. Two biopsies were performed, three pieces of tissue being removed each time; all of these were reported to be scar tissue, and there was no carcinoma. The difficulty in swallowing increased until the patient could take nothing but fluids. He was put under the fluoroscope and a circular constriction was found just above the tracheotomy opening. I tried to pass an esophagoscope, but even the smallest bougie would not enter. It was difficult to manage the patient, so it was decided to open the esophagus, cut through the stricture and dilate it. This was done, and by the passing of dilators up and down and the keeping of the region open by means of a tracheotomy tube kept in place for twenty-four hours at a time, at the end of four or five weeks there was dilatation as large as the normal esophagus. It was intended to close the wound by a plastic procedure, but a small abscess developed in the skin, so this has been postponed.

I think that one does not see many cases in which after a year the esophagus becomes thus constricted without any recurrence of the malignant growth. In this case biopsy at the present time shows no evidence of recurrence.

With reference to laryngofissure, I do not believe that one should do this operation at one sitting. Dr. Tucker has stated that in about 40 per cent of cases he has to do a second operation in order to remove the granulation tissue. It is my habit to do a tracheotomy and then to pack the wound for about a week. There is never any granulation tissue, and the wound heals well. In one patient operated on two years ago the hyoid bone was split, and the wound was packed, and in from three to four months there was reformation of the scar tissue that resembled the normal cord.

CONTINUOUS RHYTHMIC MOVEMENTS OF THE PALATE, PHARYNX AND LARYNX. DR. NORMAN LESHIN.

Continuous rhythmic movements of the palate, pharynx and larynx occurring synchronously are of considerable interest, because they are comparatively rare and they signify definite evidence of organic brain disease. In reviewing the literature up to 1930, Dr. Stone and I found only twenty-seven cases, including our own, that showed these movements. Since then Jelínek and Sachs, in the *Časopis lékařuv českých* (**69**:64 [Jan. 10] 1930, and Childrey and Parker, in the

ARCHIVES OF OTOLARYNGOLOGY (**14**:139 [Aug.] 1931), each report an additional case, bringing the total number to twenty-nine. These cases should not be confused with those having isolated movements of the palate and pharynx, which are more common and may be functional in etiology.

Twenty-four of the cases reviewed showed definite evidence of organic disease of the brain. Nineteen cases revealed positive evidence of cerebellar dysfunction; fourteen showed cerebral arteriosclerosis and three bulbar palsy. Only six cases included postmortem reports. All these revealed cerebellar as well as cerebral pathologic conditions. In three of those reported by Klien, movements on the left side showed a left cerebellar disease, movements on the right side, a right cerebellar pathologic condition and bilateral movements, bilateral cerebellar involvements. From this evidence I feel justified in assuming a central lesion of the brain when these synchronous rhythmic movements are present.

The common characteristics of these movements are that they involve the palate, pharynx and larynx. They are constant, synchronous, gross and oscillatory, having two phases, a rapid and a slow one, bearing no relation to the pulse or respiration. They persist under anesthesia and are usually not influenced by extraneous stimulation or the physiologic functions, nor do they interfere with these actions. The movements always occupy the same plane and direction and have a constant rhythm, their rate being usually between 120 and 180 per minutes, rarely above or below these points. The patients are generally unaware of the presence of the movements. There is usually no evidence of local paralysis or disease. The movements of the larynx are generally bilateral, whereas the movements of the palate and pharynx may be either unilateral or bilateral. In only five cases were the movements of the larynx unilateral, associated with unilateral contractions of the palate and pharynx on the same side.

Report of a Case.—A man, aged 42, gave a history of progressive weakness of the left arm and left leg for the past five years. The essential neurologic findings were left hemiparesis, including paresis of the face and tongue, with postplegic hyperkinetic movements of the left upper extremity. The left lower extremity was spastic and ataxic, with an inexhaustible ankle clonus and positive Babinski sign. The deep reflexes were bilaterally brisk, while the abdominal and cremasteric reflexes were absent on the left side. There was a spontaneous nystagmus of the first degree when the patient looked in either direction and a vertical nystagmus when he looked upward. The entire posterior pharyngeal wall was in a continuous to-and-fro movement to the left at a rate of 132 per minute. The left posterior faucial pillar was also in rhythmic motion, moving toward the midline and back again synchronously with the movements of the pharynx. Slight movements were transmitted to the palate, especially on the left side, which seemed to rise and fall. The uvula showed rotary backward and upward movement. Examination of the larynx revealed both vocal cords and arytenoids in similar rhythmic motion. The true vocal cords and arytenoids approached each other and then returned, occupying approximately one third of their normal excursions, never meeting in the midline. The right cord moved more than the left. The adduction was quicker than the abduction, and the rate here also was 132 per minute. The movements ceased during phonation. Slight synchronous movements were also present in the false cords and in both aryepiglottic folds, especially the right. All the movements were synchronous at a rate of 132 per minute. The composite picture is a quick phase composed of the rising of the palate and uvula and movement to the left of the posterior pharyngeal wall with adduction of the left posterior faucial pillar and both arytenoids and true vocal cords, followed by a secondary slower return of these structures to their former positions. A diagnosis of multiple sclerosis was made.

The motion picture of these movements shows their characteristics clearly. A complete review of all of the cases reported that showed these movements, including a detailed description of this case, appeared in *Archives of Neurology and Psychiatry* (**26**:1236 [Dec.] 1931).

DISCUSSION

DR. ALFRED LEWY: I should like to have Dr. Leshin tell what kind of camera he used in taking his motion pictures of the eyes, palate, larynx and pharynx which are the best I have ever seen. They are better than those made in some of the university laboratories with much more elaborate equipment. What lens, what aperture, what illumination was used and was a special mirror employed?

DR. NORMAN LESHIN: A large laryngeal mirror was used for the photographing of the movements of the larynx, the indirect image being photographed from the mirror. Two 500 watt lights were used for the exposure, and a model A Eastman Cinekodak was used with a telephoto lens and an S4 aperture. A reversal 16 mm. panchromatic film was used.

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLARYNGOLOGY

H. P. SCHENCK, M.D., *Reporter*

Dec. 15, 1931

RALPH BUTLER, M.D., *Chairman*

MOTION PICTURES OF THE LARYNX. DR. C. A. HEATLEY, Rochester, N. Y. (by invitation).

In presenting a short film of motion pictures of the larynx, the important possibilities of laryngeal photography in the teaching of laryngology as well as in recording rare cases, were stressed. There is great difficulty in photographing small objects. In 1883, Lenox Brown took the first photograph of the larynx, but he and his co-workers saw no future for photography of the larynx. Thomas French, in 1884, produced photographs of really surprising merit by attaching a camera to a mirror and reflecting sunlight toward the patient's larynx by means of a system of truncated cones. Later he developed a powerful arc light which accomplished the same end. This work was forgotten until 1913, when Garel produced the stereoscopic camera. Dr. Clerf has used this camera sufficiently to be most familiar with its intricacies. Most of the methods developed are too technical to appeal to most laryngologists. The teaching possibilities of the motion picture have come into prominence in recent years. Russell, in 1930, obtained small pictures of the larynx, but he was more interested in phonetics than in pathology.

The apparatus used to obtain motion pictures of the larynx was shown in lantern slides. The chief problem is that of constructing an apparatus that may be used by any laryngologist. In this instance, an ordinary direct laryngoscope was used with the patient under local anesthesia. The instrument is purely experimental and was constructed without support from any manufacturer. A model B Cine-Kodak is placed on the opposite side of the lens. A side lens gives control of the field on the end of the laryngoscope. The greatest difficulty lies in securing adequate illumination of the larynx. This instrument focuses the rays to the end of a quartz rod which carries the light directly to the end of the laryngoscope, and the light is virtually sprayed over the larynx. About 400 to 500 foot candle-power is obtained. The lens and the film back of it are centered on the axis of the laryngoscope.

The film itself demonstrated the normal larynx, paralysis of the left vocal cord secondary to an aneurysm and early carcinoma of the vocal cord. These photographs prove that laryngeal motion picture photography is feasible and practical. The intensity of the illumination may be readily increased and more

sensitive films used. Color photography may be possible with greater illumination but this will require from twenty-five to thirty times the intensity of light used in the film shown tonight. Color photography is not practical at the present time.

DISCUSSION

DR. JAMES A. BABBITT: Did the investigators discover anything by this type of photography that the ordinary examination would fail to discover?

DR. LEWIS H. CLERF: Since I have worked with the Garel instrument, I can especially appreciate what Dr. Heatley has accomplished in these films. Their lighting system is a distinct contribution. The larynx is inaccessible, but the main handicap in photography lies in the fact that we are trying to take a picture of a moist surface. It is difficult to show the anterior and posterior portions of the larynx at the same time with the direct laryngoscope. Dr. Heatley has presented a real bit of pioneer work.

DR. EDWARD B. GLEASON: These are beautiful pictures and good enough for diagnostic purposes.

DR. ROBERT F. RIDPATH: I have several times tried to photograph the larynx by means of a motion picture camera but never was successful. Supersensitive film will undoubtedly aid further work. I should like to ask Dr. Heatley what type of lens was used. Color film, which will be put on the market by the British within the next six months, will make color photography of this type possible.

DR. NATHAN P. STAUFFER: I should like to ask Dr. Heatley how he fixes his camera on the laryngoscope. With polychromatic film, one can get as good pictures as with black and white film.

DR. C. A. HEATLEY: We did not see anything in our photographs that we had not previously observed in direct laryngoscopy. Such photography is not yet good enough for finding new facts. The camera is fixed on an aluminum plate, and the laryngoscope is similarly fixed to the plate so that the whole apparatus is passed as one unit. Both instruments are fixed to the central plate to form a unit. Dr. Clerf has brought out the chief objection to the direct laryngoscope, that of its interference with function of the epiglottis. The other method of approach would be better.

DR. HENRY DINTENFASS: The difficulties as I see them are the necessity of a wide open buccal cavity, the necessity of the proper amount of light and the prevention or the inhibition of motion of the vocal cords by the simple laryngoscope. This instrument I am exhibiting, devised by Russell and Tuttle, has a tendency to eliminate Dr. Clerf's objection. With this instrument one can see the movements of one's own vocal cords.

MOTION PICTURES OF RADICAL FRONTAL SINUS OPERATIONS. DR. SAMUEL SKILLERN.

The modified Lothrop, or Skillern-Lothrop operation, was demonstrated. The eyebrows are cut or trimmed by means of a scissors instead of shaving them, to prevent later excessive growth of the hair. The incision is made in the hair line, and the periosteum is carefully elevated with the overlying soft tissues. It has been found easier to elevate the periosteum in this fashion rather than separately. The sinus is opened above the superciliary ridge, and sufficient bone is removed to obtain a good exposure and destroy any necrotic area. In bilateral procedures a similar incision is made on the opposite side and the medial ends of the two incisions joined across the root of the nose. The anterior tip of the middle turbinate is removed, and the frontal duct is rasped out. This passage is later cleared of diseased tissue and spicules of bone by pulling a gage strip back and forth. The modified Lothrop procedure is preferable because it requires less operating time and less anesthesia and produces less shock. Constant pressure on the orbit during the Killian operation results in edema of the eyelids and

danger to the optic nerve, while there is ever danger of injury to the lacrimal duct. Septal cells as well as small supra-orbital cells may be overlooked.

All diseased tissue must be removed to get results. An important step in the operation consists of the beveling of the upper edge of bone. This beveling is a factor in preventing later deformity. The accurate approximation or even over-suturing of the periosteum is likewise important in preventing later deformity. It is better to actually overlap the periosteum in closure to ensure integrity of this area. Complete regeneration of bone may be expected if these precautions are observed. In bilateral as well as in unilateral cases, the interfrontal septum is removed. This removal in unilateral cases permits aeration of the diseased sinus by way of the normal sinus, and there is no danger of infection of the normal sinus if it has normal ventilation. This frequently leads to discovery of infection in the supposedly normal sinus, and it may then be handled at once without subjecting the patient to further operation. The important advantages of this operation are the excellent exposure obtained and the minimum of scarring that is noted later.

DISCUSSION

DR. NATHAN B. STAUFFER: I congratulate Dr. Skillern for his beautiful pictures. His reason for the little scarring is the retention of the periosteum. I get scarring anyway. I think he could have done a modified Killian operation in this case and there would then have been less scarring. I like to clean out the ethmoid, sphenoid and antrum at the same time.

DR. EDWARD B. GLEASON: I congratulate Dr. Skillern on his results in this case. It was difficult to demonstrate any scar. In the motion picture we have a method of teaching operative technic. The best method of becoming proficient is to serve a long apprenticeship. At the operating table the observer is apt to have his attention drawn to the anesthetist, the assistant or other visitors, and the operator may be too busy to demonstrate. Motion pictures show more than does the actual operation, for in arranging the film attention may be focused on the important features of the procedure. In the dissecting room we can demonstrate technic a little better than in a motion picture.

DR. GEORGE M. COATES: This type of operation is much easier to perform in many ways than the old Killian procedure, and the after-care is easier. In this operation the bony walls of the duct are preserved, and the pulling of the gauze back and forth is an important step to clear out the spicules of bone and débris. The modified Killian operation, where the external plate is left intact, has the disadvantage in a big sinus of not permitting exploration of the whole sinus; also care is necessary afterward to keep the passage open, and often there is danger of diplopia.

DR. KARL M. HOUSER: What type of incision is used if only one side is opened?

DR. SAMUEL SKILLERN: In opening one side, the first incision I showed is the one used. One can expose the whole sinus by undermining. The reason Dr. Stauffer gets sinking in may be because the periosteum is not permitted to overlap enough. The disadvantage of the Killian operation is that it is terribly disfiguring. The Lynch operation is excellent for a small frontal sinus. One cannot look around edges and angles or through bone. The best plan is to expose everything.

MOTION PICTURE DEMONSTRATION OF RADICAL OPERATION ON THE MAXILLARY SINUS UNDER LOCAL ANESTHESIA (CALDWELL-LUC). DR. HENRY DINTENFASS (by invitation).

The technic used has been essentially the same employed during the past five years. Ampules containing 2 per cent procaine hydrochloride with epinephrine are employed. Care is employed to infiltrate so that overlapping fibers are reached. Anesthesia of the nasal mucous membrane is induced by the local application of cocaine and by the injection of the mixture in the ampule into the canalis incisivus

and canalis sphenopalatinus. An incision is made at the junction of the labial and gingival mucous membrane, and the periosteum with the overlying tissue is retracted. An opening is made in the area of thin bone of the canine fossa and enlarged to permit a view of the interior of the antrum. The diseased mucous membrane and polyps were removed from the antrum, and an opening was chiseled in the naso-antral wall. The cavity was packed with iodoform gauze which passed into nose through the naso-antral opening, and the wound was closed by a single suture. It was evident that the procedure was without pain.

DISCUSSION

DR. ROBERT F. RIDPATH: I have used local anesthesia in a number of Caldwell-Luc operations but I always encounter some condition I did not know was there. I have found so many conditions not diagnosed before operation, that I now prefer general anesthesia. I notice that there was practically no bleeding in this case. In my cases, I usually find profuse bleeding. Not long ago I operated on a patient whose condition proved to be sarcoma, and in the next case I also found a sarcoma, although it was not suspected. I now use avertin in most of my cases.

DR. GEORGE M. COATES: I should like to ask Dr. Dintenfass in what percentage of his cases numbness of the teeth has occurred after operation. The vertical incision has been recommended to prevent this.

DR. HENRY DINTENFASS: The technic of local injection may be limited to two points of entry, the second division of the maxillary and the infra-orbital on the other side. These take care of all overlapping fibers, and only two injections are necessary. With small incisions the numbness is not apt to occur.

MOTION PICTURE DEMONSTRATION OF OBSTRUCTIVE DYSPNEA: BRONCHOSCOPIC OBSERVATIONS. DR. GABRIEL TUCKER.

Obstructive dyspnea may be defined as dyspnea due to obstruction in the airway. It may be classified (1) as high obstructive dyspnea, when the obstructing lesion occurs in the pharynx, larynx or upper part of the trachea; (2) low obstructive dyspnea, when it occurs in the lower part of the trachea and main bronchi, and (3) bronchial obstructive dyspnea, when the obstruction is in the small bronchi. Obstructive dyspnea might also with propriety be called surgical dyspnea, because in the majority of instances relief and cure of the condition are obtained only by surgical measures. As an example of the common causes of high obstruction producing dyspnea may be mentioned retropharyngeal abscess, edema of the larynx, foreign body in the larynx or pharynx, laryngeal diphtheria, tumors of the larynx, etc. In high obstruction, relief from dyspnea is obtained by surgical removal of the obstruction, intubation or tracheotomy; and while medical assistance is also necessary, as in the laryngeal diphtheria, the emergency requires surgical aid. In low obstruction, relief may be obtained by the bronchoscopic removal of the foreign body, by removal of intrabronchial tumors bronchoscopically, and by the surgical removal of mediastinal tumors which may be producing tracheal or bronchial compression. In bronchial obstructive dyspnea, when a foreign body or secretion is the etiologic factor, bronchoscopic removal is the surgical method of choice. Spasm plays practically no part in obstructive dyspnea, and for this reason morphine is contraindicated. If the patient is so dyspneic that he cannot sleep, it is because he has to use his accessory respiratory muscles to breathe. Sedative doses of morphine will, in many instances, put him to sleep, stop the action of the accessory respiratory muscles and produce asphyxiation. Because of the necessity for surgical aid, diagnosis should be made without delay. Careful examination, general and local, and roentgen study is necessary. Laryngoscopy, direct laryngoscopy and bronchoscopy definitely localize the obstruction.

The symptoms and signs of high obstruction (obstructive laryngeal dyspnea) are pathognomonic. The sign of most importance is the characteristic indrawing of the suprasternal notch, the epigastrium and the intercostal spaces and supra-

clavicular spaces on inspiration accompanied by dyspnea. The obstruction is greatest on inspiration because of the trapdoor-like action of the vocal cords. The floor of the ventricles of the larynx is higher at the margin of the cord than it is at the outer side of the ventricle. The air passing inward has a tendency to pull the cords together, narrowing the glottis. This produces an increase in the negative pressure on the inside of the chest with the resultant typical indrawing. The sign appears early, particularly in children, is worse on exertion, and becomes progressively more marked as the obstruction increases. Usually stridor and wheeze are present. Restlessness in children is a very important sign, and inability to sleep, combined with indrawing, is an indication for surgical relief of the dyspnea. The diagnosis is made by the signs and the local examination. The exact condition can best be determined in most cases by direct laryngoscopy and bronchoscopy. If relief cannot be obtained by local endoscopic treatment of the larynx or pharynx, intubation may be done, or the bronchoscope can be inserted and tracheotomy performed properly in an orderly manner with the bronchoscope in position.

The indrawing and obstructive dyspnea must be distinguished from the indrawing in certain patients with the so-called "soft chest" and in congenital types of chest where the indrawing occurs because of lack of support in the bony and cartilaginous frame work. In these cases inspiratory indrawing may occur both at the tip of the ensiform and the suprasternal notch without any sign of dyspnea. There is no wheeze, no stridor, no dyspnea, and bronchoscopic examination is entirely negative for obstruction in the pharynx, larynx, trachea or bronchi.

In low obstruction, the symptoms and signs are usually characteristic also. Examination of the chest shows indrawing to be greatest at the tip of the sternum and the lower intercostal spaces. There will be little or no indrawing at the suprasternal notch or above the clavicle. Stridor is usually absent. There is, however, a distinct wheeze which is usually loudest on expiration. The voice is likely to be clear. Roentgenograms may give definite localization of the lesion. The final diagnosis is by bronchoscopic inspection of the lower part of the trachea and bronchi. The treatment is surgical removal of the obstruction, for example, by endoscopic removal of the foreign body.

In the third type, bronchial obstructive dyspnea, in which the obstruction is in the smaller bronchi, there is no indrawing. The clinical picture is very similar to that of asthma. There is bilateral emphysema, with an expiratory wheeze. In the cases observed, morphine and epinephrine failed to relieve the dyspnea. On bronchoscopic examination, obstructive material was removed from the smaller bronchi with immediate relief from symptoms.

DISCUSSION

DR. JOSEPH F. STOKES: Were it not for the endoscopists, pediatricians would be lost in the handling of these cases. One medical type may be confused with these cases. Intracranial conditions, such as encephalitis, tuberculous meningitis, poliomyelitis, etc. must be distinguished as such and not confused with these obstructive conditions. Such intracranial conditions frequently give paresis of the vocal cords and involve muscles, the action of which may confuse us with actual obstruction due to a foreign body. In scarlet fever, convulsions over a long enough period of time give anoxemia and may not be recognized as an actual cerebral condition. Endoscopy rules out a foreign body or some definite form of obstruction, but one must remember that in the poliomyelitis type a respirator should be at hand and atropine not withheld. Retropharyngeal abscess may act as a foreign body. Casts in acute bronchopneumonia may be observed far down in the bronchial tree.

Directory of Otolaryngologic Societies *

NATIONAL

American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Gabriel Tucker, Bronchoscopic Clinic, Hospital of the University of Pennsylvania, Philadelphia.
Secretary: Dr. John J. Shea, 1018 Madison Ave., Memphis, Tenn.
Place: New Orleans. Time: May 9-13, 1932.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. S. Hanford McKee, 1528 Crescent St., Montreal, Canada.
President-Elect: Dr. B. R. Shurley, 62 W. Adams Ave., Detroit.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Montreal, Canada. Time: Sept. 19-23, 1932.

American Bronchoscopic Society

President: Dr. Louis H. Clerf, 128 S. Tenth St., Philadelphia.
Secretary: Dr. Richmond McKinney, 899 Madison Ave., Memphis, Tenn.
Place: Atlantic City, N. J. Time: May 21, 1932.

American Laryngological Association

President: Dr. George E. Shambaugh, 122 S. Michigan Ave., Chicago.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: Atlantic City, N. J. Time: May 19-21, 1932.

American Laryngological, Rhinological and Otological Society

President: Dr. Edmund Prince Fowler, 140 E. Fifty-Fourth St., New York.
Secretary: Dr. R. L. Loughran, 33 E. Sixty-Third St., New York.
Place: Atlantic City, N. J. Time: May 23-25, 1932.

American Otological Society

President: Dr. L. W. Dean, Washington University, St. Louis.
Vice President: George L. Tobey, 270 Commonwealth Ave., Boston.
Secretary: Dr. Thomas J. Harris, 104 E. Fortieth St., New York.
Place: Atlantic City, N. J. Time: May 17-19, 1932.

New Zealand British Medical Association, Ear, Nose and Throat Section

Chairman: Dr. James Hardie Neil, Auckland.
Secretary: Dr. W. Gillies Borrie, Auckland.
Time: March 28, 1932.

SECTIONAL

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. F. M. Sulzman, 1831 Fifth Ave., Troy.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

New England Otological and Laryngological Society

President: Dr. Henry A. Barnes, 520 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. Lyman G. Richards, 319 Longwood Ave., Boston.

Pacific Coast Oto-Ophthalmological Society

President: Dr. W. F. Hoffman, 317 Summit Ave., Seattle.
Secretary-Treasurer: Dr. J. Frank Friesen, 1208 Roosevelt Bldg., Los Angeles.
Place: Seattle: Time: June 30-July 2, 1932.

Puget Sound Academy of Ophthalmology and Oto-Laryngology

President: Dr. John H. Harter, 1215 Fourth Ave., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, 806 Cobb Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Sioux Valley Eye and Ear Academy

President: Dr. John B. Gregg, 101 S. Main Ave., Sioux Falls, S. D.
Secretary-Treasurer: Dr. Frederick H. Roost, 420 Trimble Bldg., Sioux City, Iowa.
Place: Sioux City, Iowa. Time: November, 1932.

Southern Medical Association, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Wiley R. Buffington, 211 Camp St., New Orleans.
Secretary: Dr. W. D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: Birmingham, Ala. Time: November, 1932.

Southwestern Michigan Triological Society

President: Dr. C. W. Ellis, 215 N. Walnut St., Lansing.
Secretary: Dr. H. B. Weinburgh, 301 Seymour St., Lansing.
Time: Third Thursday of alternate months.

STATE

Colorado Oto-Laryngological Society

President: Dr. F. J. Peirce, 511 N. Main St., Pueblo.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

Connecticut State Medical Society, Section on Eye, Ear, Nose and Throat

President: Dr. M. H. Merriman, 115 Prospect St., Waterbury.
Secretary-Treasurer: Dr. Walter L. Hogan, 750 Main St., Hartford.

Eye, Ear, Nose and Throat Club of Georgia

President: Dr. William L. McDougall, 50 Whitehall St., S. W., Atlanta.
Secretary-Treasurer: Dr. William O. Martin, Jr., 412 Medical Arts Bldg., Atlanta.

Indiana Academy of Ophthalmology and Oto-Laryngology

President: Dr. J. R. Gillum, 221 S. Sixth St., Terre Haute.
Secretary: Dr. J. Kent Leasure, 611 Hume-Mansur Bldg., Indianapolis.

Iowa Academy of Ophthalmology and Oto-Laryngology

President: Dr. Royal French, 28 S. First Ave., Marshalltown.
Secretary-Treasurer: Dr. W. F. Boiler, 105 East Iowa Ave., Iowa City.

Michigan State Medical Society, Section of Ophthalmology and Otolaryngology

Chairman: Dr. Wilfred Haughey, 303 Post Bldg., Battle Creek.
Secretary: Dr. H. O. Westervelt, 239 Pipestone St., Benton Harbor.

Minnesota Academy of Ophthalmology and Oto-Laryngology

President: Dr. Douglas Wood, 74 S. Ninth St., Minneapolis.
Secretary-Treasurer: Dr. W. E. Camp, Medical Arts Bldg., Minneapolis.
Time: Second Friday of each month, October to May.

Montana Academy of Oto-Ophthalmology

President: Dr. W. J. Marshall, 212 N. Higgins Ave., Missoula.
Secretary: Dr. A. W. Morse, Phoenix Bldg., Butte.
Time: Semi-annually.

New York State Medical Society, Eye, Ear, Nose and Throat Section

Chairman: Dr. R. T. Atkins, 4 W. 53d St., New York.
Secretary: Dr. D. F. Gillette, 109 S. Warren St., Syracuse.
Place: Buffalo. Time: May 23-24, 1932.

NEW JERSEY STATE MEDICAL SOCIETY, SECTION ON OPHTHALMOLOGY, OTOLOGY AND RHINOLARYNGOLOGY

Chairman: Dr. H. L. Harley, 101 S. Indiana Ave., Atlantic City.
Secretary: Dr. B. E. Failing, 31 Lincoln Park, Newark.
Place: Atlantic City. Time: June 15-17, 1932.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. F. L. Wicks, Valley City.
Secretary-Treasurer: Dr. W. L. Diven, National Bank Bldg., Bismarck.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. H. M. Hendershott, 193 Eleventh St., Portland.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

RHODE ISLAND OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Frank W. Dimmitt, 195 Thayer St., Providence.
Secretary: Dr. N. A. Bolotow, 108 Waterman St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

SOUTH CAROLINA MEDICAL ASSOCIATION, SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. W. B. McWhorter, 106 E. Earle St., Anderson.
Secretary-Treasurer: Dr. G. M. Truluck, Orangeburg.
Time: April and December.

TEXAS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY

President: Dr. W. D. Jones, 3116 Live Oak St., Dallas.
Secretary: Dr. A. F. Clark, 1034 Nix Bldg., San Antonio.
Place: Fort Worth. Time: December, 1932.

UTAH OPHTHALMOLOGICAL SOCIETY

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Erza Thompson Bldg., Salt Lake City.

VIRGINIA SOCIETY OF OTOLARYNGOLOGY AND OPHTHALMOLOGY

President: Dr. C. P. Jones, 3117 West Ave., Newport News.
Secretary-Treasurer: Dr. Henry Grant Preston, Harrisonburg.

WEST VIRGINIA STATE MEDICAL ASSOCIATION, EYE, EAR, NOSE AND THROAT SECTION

President: Dr. G. A. Smith, Montgomery.
Secretary: Dr. O. H. Bobbitt, Medical Arts Bldg., Charleston.

LOCAL

ACADEMY OF MEDICINE OF NORTHERN NEW JERSEY, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Charles W. Buvinger, 50 Washington St., East Orange.
Secretary: Dr. Earl LeRoy Wood, 192 Roseville Ave., Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. W. L. McDougall, 50 Whitehall St., S.W., Atlanta, Ga.
Secretary: Dr. William O. Martin, Jr., 412 Medical Arts Bldg., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: 8 p. m., last Thursday of each month.

Baltimore City Medical Society, Section on Otology and Laryngology

President: Dr. James J. Chisolm, Medical Arts Bldg., Baltimore.
Secretary: Dr. Louis Diener, 2449 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

Buffalo Oto-Laryngological Society

President: Dr. John F. Healey, 925 Delaware Ave., Buffalo.
Secretary-Treasurer: Dr. Herrmann E. Bozer, 468 Delaware Ave., Buffalo.
Place: Buffalo Club. Time: Second Tuesday of each month from September to May, inclusive.

Chicago Laryngological and Otological Society

President: Dr. Howard C. Ballenger, 25 E. Washington St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

Cincinnati Oto-Laryngological Society

President: Dr. M. F. McCarthy, Union Central Bldg., Cincinnati.
President-Elect: Dr. Henry M. Goodyear, 19 Garfield Pl., Cincinnati.
Secretary-Treasurer: Dr. Samuel Seltz, Provident Bank Bldg., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. M. W. Jacoby, 2323 Prospect Ave., Cleveland.
Secretary: Dr. H. C. Rosenberger, 1065 Rose Bldg., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.
President: Dr. Edward D. King, 707 Race St., Cincinnati.

College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. Ralph Butler, 2007 Chestnut St., Philadelphia.
Clerk: Dr. Karl M. Houser, 1826 Pine St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Columbus Ophthalmological and Otolaryngological Society

Chairman: Dr. Ivor G. Clark, 188 E. State St., Columbus, Ohio.
Secretary-Treasurer: Dr. Francis W. Thomas, 327 E. State St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. L. M. Sellers, 1717 Pacific Ave., Dallas, Texas.
Secretary: Dr. W. Mood Knowles, 1717 Pacific Ave., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6:30 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Des Moines Academy of Ophthalmology and Otolaryngology

President: Dr. C. F. Howland, 604 Locust St., Des Moines, Iowa.
Secretary-Treasurer: Grace Doane, 614 Bankers Trust Bldg., Des Moines, Iowa.
Time: Third Monday of each month, September to May, inclusive.

Detroit Oto-Laryngological Society

President: Dr. Raymond Goux, 1551 Woodward Ave., Detroit.
Secretary-Treasurer: Dr. R. Lee Laird, 513 David Whitney Bldg., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. R. H. Needham, 1304 Medical Arts Bldg., Fort Worth, Texas.
Secretary: Dr. Van D. Rathgeber, 1011 Medical Arts Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Grand Rapids Eye, Ear, Nose and Throat Society

President: Dr. Carl F. Snapp, Medical Arts Bldg., Grand Rapids, Mich.
Secretary-Treasurer: Dr. Walter W. Oliver, 26 Sheldon Ave., Grand Rapids, Mich.
Place: Various local hospitals. Time: 6:30 p. m., third Thursday of alternating months, September to May.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. L. W. Raney, 609 Fannin St., Houston, Texas.
Secretary: Dr. J. F. Gamble, 201 Main St., Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. B. J. Larkin, 23 E. Ohio St., Indianapolis.
Secretary: Dr. Kenneth L. Craft, 23 E. Ohio St., Indianapolis.
Place: Indianapolis Athletic Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. W. E. Keith, 1103 Grand Ave., Kansas City, Mo.
Secretary: Dr. O. S. Gilliland, Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. R. R. Montgomery, 102 Pine Ave., Long Beach, Calif.
Secretary-Treasurer: Dr. Russell T. Uhls, 823 Security Bldg., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. J. Frank Friesen, 1208 Roosevelt Bldg., Los Angeles.
Secretary-Treasurer: Dr. F. H. Brandt, 1052 W. Sixth St., Los Angeles.
Place: Mary Louise Cafe. Time: 6:30 p. m., fourth Monday of each month, May to November, inclusive.

Medical Society of the County of Kings, Section on Otolaryngology

Chairman: Dr. Edward Leo Berger, 903 Park Pl., Brooklyn.
Secretary-Treasurer: Dr. Oscar Rodin, 893 Eastern Parkway, Brooklyn.
Place: Library Bldg., County Society, 1313 Bedford St., Brooklyn.
Time: 9 p. m., second Wednesday of January, March, May and November.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. James A. Flynn, 1511 Rhode Island Ave., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St., N. W. Time: 8 p. m., third Friday of each month.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

The Milwaukee Oto-Ophthalmic Society

President: Dr. T. F. McCormick, 324 E. Wisconsin Ave., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 324 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. Hilliard Wood, 700 Church St., Nashville.
Secretary-Treasurer: Dr. H. C. Smith, Medical Bldg., Nashville.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month, October to June.

New Orleans Ophthalmological and Otological Society

President: Dr. Charles A. Bahn, 150 Baronne St., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. Charles Imperatori, 17 E. 38th St., New York.
Secretary: Dr. Marvin F. Jones, 121 E. 60th St., New York.
Place: 103d St., and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. W. P. Haney, 107 S. 17th St., Omaha.
Vice President: Dr. L. G. Howard, 532, 1st Ave., Council Bluffs, Iowa.
Secretary-Treasurer: Dr. W. A. Cassidy, 1620 Medical Arts Bldg., Omaha.
Place: University Club, 1914 Harney St., Omaha. Time: Dinner, 6 p. m. Program, 7 p. m., third Wednesday of each month from October to May.

Philadelphia Laryngological Society

President: Dr. Arthur J. Wagers, 1429 Spruce St., Philadelphia.
Secretary: Dr. Herman B. Cohen, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

Pittsburgh Otological Society

Chairman: Dr. James Homer McCready, 121 University Pl., Pittsburgh.
Secretary-Treasurer: Dr. Roy C. Cooper, 510 S. Aiken Ave., Pittsburgh.

Richmond Ophthalmological and Oto-laryngological Society

President: Dr. William R. Weisiger, Medical Arts Bldg., Richmond, Va.
Secretary: Dr. R. W. Vaughan, Medical Arts Bldg., Richmond, Va.
Place: Westmoreland Club. Time: 6 p. m., second Monday of each month from October to May.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. E. S. Amsler, 53 S. Fitzhugh St., Rochester, N. Y.
Secretary-Treasurer: Dr. E. W. O'Brien, 5 N. Goodman St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. Arthur W. Proetz, 3720 Washington Blvd., St. Louis.
Secretary: Dr. B. J. McMahon, 813 Missouri Bldg., St. Louis.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. Scott Applewhite, 706 Medical Arts Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. E. D. Dumas, 425 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

San Francisco County Medical Society, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Robert Carson Martin, 384 Post St., San Francisco.
Secretary: Dr. George N. Hosford, 490 Post St., San Francisco.
Place: Society's Building, 2180 Washington St., San Francisco. Time: Third Tuesday of every month except May, June, July and December.

Shreveport Eye, Ear, Nose and Throat Society

President: Dr. J. L. Scales, Medical Arts Bldg., Shreveport, La.
Secretary-Treasurer: Dr. W. L. Atkins, 505 Medical Arts Bldg., Shreveport, La.
Place: 1240 Texas Ave. Time: 7:30 p. m., first Monday of each month from October to June.

Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. David Hartin, 422 Riverside Ave., Spokane, Wash.
Secretary: Dr. W. W. Henderson, Paulsen Medical and Dental Bldg., Spokane, Wash.
Place: Paulsen Medical and Dental Library. Time: 8 p. m., fourth Tuesday of each month except June, July and August.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. M. G. Brown, 713 Genesee St., Syracuse, N. Y.
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